ENVIRONMENTAL ASSESSMENT

REDUCING MAMMAL DAMAGE

IN MISSOURI

FINAL

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UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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SUMMARY OF PROPOSED ACTION

The United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) proposes to continue the current damage management program that responds to mammal damage in the State of Missouri. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to minimize mammal damage to property, agricultural resources, and natural resources; to reduce adverse mammal impacts on human and livestock health and safety; and to aid in surveillance for, and management of, wildlife diseases. Damage management would be conducted on public and private property in Missouri when the resource owner (property owner) or manager requests assistance or when assistance is requested by an appropriate State, Federal or local government agency. The IWDM strategy would encompass the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance (advice) and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, non-lethal methods like physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, mammals would be removed as humanely as possible using shooting, trapping, registered pesticides and other methods. Preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. WS involvement in mammal damage management in Missouri is closely coordinated with the Missouri Department of Conservation (MDC). All WS actions are conducted in compliance with applicable Federal, State, Tribal, and local laws, policies and regulations.

ACRONYMS

ADC[1]	Animal Damage Control
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
MDM	Mammal Damage Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEA	Drug Enforcement Administration
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
MASS	Missouri Agriculture Statistics Service
MBTA	Migratory Bird Treaty Act
MDA	Missouri Department of Agriculture
MDC	Missouri Department of Conservation
MDH	Missouri Department of Health
MDNR	Missouri Department of Natural Resources
MBTA	Migratory Bird Treaty Act
MDM	Mammal Damage Management
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
ORV	Oral Rabies Vaccination
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TGE	Transmissible Gastroenteritis
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS[1]	Wildlife Services

[1] On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The phrases Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with the needs of wildlife which increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife. This protection can also contribute to localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (United States Department of Agriculture (USDA) 1997 Revised):

> *"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well."*

Wildlife damage management (WDM) is the science of reducing damage or other problems associated with wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1992). The USDA, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program uses an Integrated Wildlife Damage Management (IWDM) approach (WS Directive 2.105[2]), in which a combination of methods may be used or recommended to reduce wildlife damage (USDA 1997 Revised). These methods may include non-lethal techniques like alteration of cultural practices, habitat management, and animal behavioral modification to prevent or reduce damage. The reduction of wildlife damage may also require removal of individual animals or reduction in local animal populations through lethal means.

This environmental assessment (EA) documents the analysis of the potential environmental effects of alternatives for WS involvement in mammal damage management (MDM) in Missouri. This analysis relies on data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997 Revised). The final environmental impact statement (USDA 1997 Revised) may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

WS is the federal agency directed by law and authorized to protect American resources from damage associated with wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). To fulfill this Congressional direction, WS activities are conducted to prevent or reduce wildlife damage to agricultural, industrial and natural resources; property; livestock; and minimize threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. Wildlife damage management is not based on punishing offending animals, but as one means of reducing damage, and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public.

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[2] The WS Policy Manual (http://www.aphis.usda.gov/ws/wsdirectives.html) provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

WS is a cooperatively funded, service-oriented program that receives requests for assistance with wildlife damage management from private and public entities, including other government agencies. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, state and local laws and Memorandums of Understanding (MOUs) between WS and other agencies. WS' mission, developed through its strategic planning process, is to provide Federal leadership in managing problems caused by wildlife. WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. The WS program carries out the Federal responsibility for helping to solve problems that occur when human activity and wildlife are in conflict with one another

WS' Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- Training of wildlife damage management professionals;
- Development and improvement of strategies to reduce losses and threats to humans from wildlife;
- Collection, evaluation, and dissemination of management information;
- Informing and educating the public on how to reduce wildlife damage;
- Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be categorically excluded {7 CFR 372.5(c), 60 Fed. Reg. 6,000 -6,003, (1995)}. WS has decided to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. Analysis in this EA replaces the analysis of alternatives for the management of mammal damage at airports in the Finding of No Significant Impact and Final Environmental Assessment, "Wildlife Damage Management at Airports in Missouri" (USDA 2001). All wildlife damage management that would take place in Missouri would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA)

1.1 PURPOSE OF THIS EA

The purpose of this EA is to address and evaluate the potential impacts on the human environment from alternatives for WS involvement in the protection of agricultural resources, natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Missouri. Damage problems can occur throughout the State. Under the Proposed Action, MDM could be conducted on private, federal, state, tribal, county, and municipal lands in Missouri where damage occurs and a request for assistance is received by WS.

Several mammal species have potential to be the subject of WS Mammal Damage Management (MDM) activities in Missouri. Mammal species addressed in this EA include but are not limited to: white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), mink/weasels (*Mustela* spp.), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), feral cats (*Felis catus),* striped skunk (*Mephitis mephitis*), badger (*Taxidea taxus*), river otter (*Lutra canadensis*), woodchuck (*Marmota monax*), nine-banded armadillo (*Dasypus novemcinctus*), feral swine (*Sus scrofa*), domestic/feral dog (*Canis familiaris*), brown (Norway) rat (*Rattus norvegicus*), black (roof) rat (*Rattus rattus*), house mouse (*Mus musculus*), Eastern cottontail rabbit (*Sylvilagus floridanus*), thirteen-lined ground squirrel (*Spermophilus tridecimlineatus*), Eastern gray squirrel, (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), Eastern mole (*Scalopus aquaticus*), plains

pocket gopher (*Geomys bursarius*), mice (*Peromyscus* spp.), and voles (*Microtus* spp.). This EA does not address the management of damage or risks to human safety caused by aquatic rodents. Management of damage and risks to human safety caused by aquatic rodents is covered in a separate analysis (USDA 2005).

1.2 NEED FOR ACTION

Conflicts between humans and wildlife are relatively common in Missouri. The need for action in Missouri is based on the requests for assistance with the protection of agriculture, property, livestock, natural resources, and human health and safety from mammal damage. Comprehensive surveys of mammal damage in Missouri have not been conducted. The data and information reported below are based on requests for assistance from the public to WS, and as such, represent only a portion of the total damage caused by mammals because not all people who experience damage request assistance from WS (Section 1.3). WS' potential involvement in the area of MDM would be to provide technical assistance (advice) on methods property owners/managers can use to prevent or reduce damage and direct management assistance with the implementation of MDM programs upon request and as permitted or otherwise authorized by the MDC. Additionally, MO WS cooperates with State and Federal agencies to address wildlife disease issues involving wild and feral mammals.

1.2.1 Need for Mammal Damage Management to Protect Human Health and Safety

In Missouri human health and safety concerns and problems associated with mammals include, but are not limited to the potential for transmission of zoonotic diseases to humans, mammal hazards at airports, and other problems.

Zoonotic Diseases. Zoonotic diseases are diseases of animals which are communicable to humans. Some of the mammals in Missouri may carry disease organisms or parasites including viral, bacterial, mycotic (fungal), protozoan and rickettsial diseases which pose a risk to humans.

Individuals or property owners that request assistance with mammals frequently are concerned about potential disease risks but are unaware of the types of diseases that can be associated with wild and feral mammals. Usually, MDM is requested because of a perceived risk to human health or safety associated with wild animals living near humans, from animals acting out of character in human-inhabited areas during the day, or showing no fear when humans are present. In the majority of cases in which human health concerns are a major reason for requesting MDM, there may have been no actual cases of transmission of disease to humans by mammals to prompt the request. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting MDM. In most cases, the risk to humans from the diseases discussed below is low and there may not have been a confirmed case of the disease in the state. However, it is the goal of agricultural and human health programs to prevent disease/illness from occurring. Wildlife Services works with cooperators on a case-by-case basis to assess the nature and magnitude of the wildlife conflict including providing information on the limitations about what we know regarding health risks associated with wild mammals. It is the choice of the individual cooperator to tolerate the potential health risks or to seek to reduce those risks.

WS' primary involvement in the management of these types of diseases would be to aid other Federal, State, and local government and research entities in monitoring for the presence or absence of diseases in wildlife and feral animals. This data can be used to predict potential risks to human health and safety and aid agencies in directing management efforts. In the unlikely event of a disease outbreak, WS could also be asked to conduct localized population reduction to prevent spread of disease to other areas.

This discussion includes a description of a wide variety of diseases associated with wild and feral mammals. Not all of these diseases are currently known to occur in Missouri. This material is provided as

an indication of the nature and range of situations where WS may be requested to provide assistance. Situations in Missouri where the threat of disease associated with wild or feral mammal populations might occur include, but are not limited to:

- Accumulated droppings from denning or foraging raccoons and subsequent exposure to raccoon roundworm in fecal deposits in a suburban community or at an industrial site where humans must work or live in areas of accumulation.

- Exposure of humans to threats of rabies posed by wildlife denning and foraging in a residential community.

Stray cats serve as major reservoirs for the bacterium *Bartonella* spp. Stray cats and their fleas (*Ctenocephalides felis*) are the only known vectors for infecting house bound cats and humans with this bacterium. Humans are not infected via the flea, but pet cats often are infected by flea bites. Human infections that may result from exposure of this bacterium via stray cats include: cat scratch disease in immunocompromized patients, bacillary angiomatosis, hepatic peliosis in immunocompromised patients, endocarditis, bacteremia, osteolytic lesions, pulmonary nodules, neuroretinitis, and neurologic diseases (Heller et al. 1997). In areas where dog rabies has been eliminated, but rabies in wildlife has not, cats often are the most significant domestic animal contracting rabies and presenting a subsequent risk of transmission to humans (Eng and Fishbein 1990; Krebs et al. 1996; Vaughn 1976).

Norway rats and roof rats present disease threats to humans. They live in close association to human habitations and provide a potential source of disease transmission. Many of these diseases are transmitted to humans and animals through primary hosts such as fleas, lice, and mites which live on rats (Schmidt and Roberts 1989). Among the diseases rats may transmit to humans or livestock are murine typhus, leptospirosis, trichinosis, salmonellosis (food poisoning), and ratbite fever (Timm 1994). Plague is a disease that can be carried by a variety of rodents, but it is more commonly associated with roof rats than with Norway rats (Timm 1994). Some diseases associated with rats are listed in Table 1-1. The Norway rat and house mouse are the domestic rodents of greatest public health concern in MO. Roof rats are sporadic in MO, and plague and murine typhus are not currently endemic in MO.

Tularemia, also know as "rabbit fever" is a disease caused by a bacterium. Tularemia typically infects animals such as rodents, rabbits, and hares. Typically, people become infected through the bite of infected ticks or tabanid flies, by handling infected sick or dead animals, by eating or drinking contaminated food or water, or by inhaling airborne bacteria. About 200 human cases of tularemia are reported each year in the U.S. Most cases occur in the south-central and western states; however cases have been reported in every state except Hawaii. Cases have also resulted from laboratory accidents. Without treatment with appropriate antibiotics, tularemia can be fatal (CDC 2003a). The causative agent of tularemia is one of the most infectious pathogenic bacteria known, requiring as few as 10 organisms to cause disease. The Working Group on Civilian Biodefense considers tularemia to be a dangerous potential biological weapon because of its extreme infectivity, ease of dissemination, and substantial capacity to cause illness and death (Dennis et al. 2001).

Table 1-1. Wildlife Diseases That Pose Potential Human Health Risks in the United States (modified from Davidson and Nettles 1997).

Disease	Causative Agent	Hosts
Anthrax	bacterium (*Bacillus antracis*)	cattle, sheep, horses, swine, white-tailed deer, dogs, cats
Dermatophilosis	bacterium (*Dermatophilus congolensis*)	mammals (wild and domestic)
Demodectic mange	mange mite (*Demodex odocoilei*)	White-tailed deer
Sarcoptic mange	mite *(Sarcoptes scabiei)*	red foxes, coyotes, domestic dogs
Swine brucellosis	bacterium (*Brucella suis)*	swine
Trichinosis	nematode *(Trichinella spiralis)*	swine, bears, raccoons, foxes, rats
Rabies	virus (Rhabidovirus)	all mammals (high risk wildlife: raccoons, foxes, skunks, bats)
Visceral larval migrans	nematode (*Baylisascaris procyonis)*	raccoons, skunks
Leptospirosis	bacteria (*Leptospira interrogans*) over 180 different serovars	All mammals
Echinococcus infection	tapeworm (*Echinococcus multilocularis)*	foxes, coyotes
Bovine brucellosis	bacterium (*Brucela abortus)*	cattle (evidence from Texas that organism has infected coyotes that scavenged aborted fetuses and placentas of infected cattle)
Toxoplasmosis	protozoan parasite (*Toxoplasma ondii)*	Cats, such as bobcats, are definitive hosts, mammals and birds are intermediate hosts
Spirometra infection	tapeworm, (*Spirometra mansonoides)*	bobcats, raccoons, foxes, dogs, cats
Murine typhus	bacteria (*Rickettsia mooseri = R. typhi*)	rats, mice, as hosts for primary flea, louse or mite host
Giardiasis	protozoan parasite (*Giardia lamblia, G. Duodenalis*, and other Giardia sp.- taxonomy controversial)	beavers, coyotes, dogs, cats
Hantavirus Pulmonary Syndrome (HPS)	Hantaviruses	Rodents (HPS has not been diagnosed in MO since 1993 when it was first identified)
Histoplasmosis	Histoplasma capsulatum	Fungus occurs in bat guano and bird droppings
Lyme Disease	Borelia burgdorferi (spirocheate)	Rodents
Plague	Yersinia pestis	Rodents
Tuberculosis	Mycobacterium bovis	Cervids

Anthrax is a disease of mammals and is caused by a spore-forming bacterium. Anthrax has an almost worldwide distribution and occurs sporadically in the U.S. The Del Rio, Texas, region reported ongoing

outbreaks of anthrax in wild deer and livestock in 2001. Other recent U.S. outbreaks include an outbreak in cattle and horses in Minnesota in 2000; in cattle, horses, and bison in North Dakota in 2000; and in cattle in Nebraska in 2001. Only 18 human cases of anthrax were reported in the U.S. between 1900 and 1978, with the majority occurring in special-risk groups, including goat hair mill or goat skin workers and wool or tannery workers. Two of the cases were laboratory related. Anthrax has also been intentionally released by individuals in order to cause harm to people and disrupt normal activities. .

Tuberculosis (TB) in humans is a disease caused by bacteria called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB can be fatal and TB was once the leading cause of death in the United States. TB is spread through the air from one person to another. The bacteria are put into the air when a person with active TB in the lungs or throat coughs or sneezes. People nearby may breathe in these bacteria and become infected. In rare instances, TB can also be caused by a species of the *M. tuberculosis* complex called *Mycobacterium bovis* which primarily infects cattle. Humans most commonly become infected with this strain of TB through consumption of unpasteurized milk products from infected cows. For example, from 2001-2005, 35 *M. bovis* cases were identified in New York City. Preliminary investigations indicate that the cases were contracted from the consumption of unpasteurized milk products from Mexico (CDC 2005*b,c*). Human TB caused by *M. bovis* in the U.S. is rare because of milk pasteurization and culling of infected cattle herds. In 1917, the federal government established a bovine TB eradication program. Livestock in most states in the U.S. have been declared free of the disease (USAHA 2004). however, TB has been found in wild white-tailed deer and in dairy herds in the Northern Lower Peninsula of Michigan (see section on Impacts on Agriculture below) and the state lost it's TB free status in 2000 (Michigan TB Eradication Project 2004*a*). In January 2005, the first-known case of transmission of TB from deer to humans was reported in Michigan. The hunter was infected when he cut his hand while gutting an infected deer. The hunter was treated with special antibiotics and was expected to make a full recovery. TB was also found in a white-tailed deer shot near a MN farm where TB was confirmed in cattle (Minnesota Department of Natural Resources 2005).

Rabies. Rabies is a fatal viral disease of mammals most often transmitted through the bite of a rabid animal. Rabies is preventable, but it is fatal without prior vaccination or post-exposure treatment. In Missouri, an estimated 800 people are treated annually with rabies post-exposure prophylaxis at a cost of $3,000 per person. In Missouri, skunks and bats are the most likely carriers of rabies. For example, of the 73 animals that tested positive for rabies in Missouri in 2005, there were 17 skunks, 54 bats, 1 dog, and one horse (Krebs et al. 2005). WS involvement in rabies management in Missouri has consisted of technical assistance and capture of suspect animals for testing.

Hazards to Public Safety at Airports. The threat to human safety from aircraft collisions with wildlife (wildlife strikes) is increasing (MacKinnon et al. 2001). Although a greater number of wildlife strikes with aircraft involve birds, the most hazardous wildlife species in terms of damage to aircraft, cost of collisions, and effects on flight, is white-tailed deer (Dolbeer et al. 2003). Animals such as deer, coyotes, skunks and raccoons often venture onto airfields and become a direct threat to planes both landing and taking off. Other mammals which pose hazards to aircraft and public safety include but are not limited to feral dogs, fox, woodchucks, and small rodents (mice and voles). The primary difficulty with mice and voles at airfields is not that they are a direct threat to aircraft, but that they attract predators (e.g., raptors, coyotes) that are a direct threat to aircraft.

WS receives requests for assistance regarding mammal damage management at civil airports and military airfields in Missouri. Since 1990, 19 Missouri Civil airports recorded more that 500 wildlife strikes, of these 209 had identifiable remains. These Missouri airports experienced strikes from gulls (6.2%), white-tailed deer (6.2%), coyotes (1.4%), other mammals (1.0%), raptors (12.9%) waterfowl (26.3%) and other birds (45.9%) that include blackbirds, starlings, pigeons, killdeer and doves. During 1993 to 2000 the Air Force Units stationed in Missouri report in excess of 375 wildlife strikes with many of the species being the same as were struck at civil airfields. (WAFB Flight Safety 2000).

At Missouri airfields during the period of 1990-2005, 20 deer/civil aircraft collisions were reported, as well as, 7 coyotes, 1 fox and 4 bats, 1 unidentified mammal. These strikes resulted in 1 aircraft destroyed, 11 with substantial damage, 7 with minor damage, 10 with no damage and 5 with no damage report submitted (FAA, Wright 2000). Since 1985 the USAF has recorded more than 190 strikes that involved aircraft and mammals. These strikes resulted in more than $496,000 in damage. Of these strikes, deer are the most costly to aircraft, with the most recent occurring at Laughlin AFB in March of 2000. A T-38 Talon hit a deer on landing and caused damage to the left main landing gear. Also at Little Rock AFB, between 1993 and 1998 three deer strikes were recorded, two in 1998. These strikes averaged over $4,600 per incident. MO airports have also had their share of mammal strikes with the most costly involving a B-2 Stealth Bomber impacting a coyote on landing. The strike caused damage to the front landing gear and brakes. While at MO airports WS has been working to reduce threats though technical assistance and direct control. Such activities include the recommendation to modify habitat, construction of fences, and use of wildlife harassment techniques.

Other Mammal Hazards to Public Health and Safety. WS may be requested to provide assistance with reduction of risk of bites and injuries from animals that appear to have lost their fear of humans and/or are behaving aggressively toward people. In many instances, these situations arise because animals are being intentionally or unintentionally fed by people and the animals have learned to associate people with food. In these instances, modifying human behavior is often the most effective conflict prevention technique.

1.2.2 Need for Mammal Damage Management to Protect Agricultural Resources

Livestock and dairy production in Missouri contribute substantially to the State's economy. In 2002, MO feedlot operators maintained 4.4 million cattle and calves accounting for 1.3 billion in sales. (NASS Census 2002). Milk production in Missouri totaled 1.7 billion pounds in 2002, yielding $300 million in sales. There were an estimated 162,000 milk cows, 2.1 million beef cows, 60,000 sheep 2.9 million pigs, 7.2 million turkeys, and 40.5 million chickens in Missouri during 2002.

Wildlife Services, the MDC and the Missouri Department of Agriculture receive requests for assistance from Missouri citizens experiencing agricultural damage problems from mammals, including, but not limited to the following damage scenarios: 1) predation on domestic animals including livestock, poultry and pets by predators like coyotes and foxes and bobcats; 2) damage to crops and stored feed by mammals such as deer, woodchucks and other rodents; and 3) risk of disease transmission.

Risk of Disease Transmission

Several of diseases including CWD, pseudorabies, tuberculosis, and, potentially, Foot-and-Mouth Disease and Classical Swine Fever affect livestock and wildlife. Monitoring for and management of these diseases would be conducted by WS in cooperation with the APHIS Veterinary Services (VS) program, MDC, the MDA or other governmental agencies. As with WS' activities to protect human health and safety, WS could play an important role in the surveillance for diseases transmissible between livestock and wildlife. Samples provided by WS can serve to establish important baseline data on the presence or absence of diseases in the state and can help identify areas where cooperators can focus disease management efforts.

Chronic Wasting Disease (CWD) is a disease of the nervous system of cervids. The disease is similar to a group of diseases referred to as transmissible spongiform encephalopathies. This group of diseases includes scrapie of sheep, bovine spongiform encephalopathy (Mad Cow Disease) and Creutzfeld-Jakob Disease of humans. The agents that cause these infections are called prions, an abnormal form of a naturally occurring nervous system protein. The disease was first recognized in 1967 at a Colorado wildlife research facility. It has now been diagnosed in wild deer and elk in Colorado and Wyoming and in wild deer in Nebraska, Illinois, South Dakota, Wisconsin, West Virginia, New York, New Mexico, and Saskatchewan. It has also been found on deer and elk farms in a number of states. Cervid (deer, elk, etc.) farming is legal in

Missouri. To date, CWD has not been found in any captive or wild cervids in Missouri. Additional information on CWD is provided in the Section 1.2.4.

WS would conduct and assist in management efforts involving infected and potentially infected animals, coordinated by or with the MDC, the MDA, and/or other Federal and State agencies, to control the occurrence and spread of CWD throughout the state of Missouri. If warranted, these efforts could include helping the appropriate regulatory agency(ies) depopulate herds of captive cervids.

Foot and Mouth Disease (FMD) is a severe, highly contagious vesicular viral disease of cloven-hoofed animals, including, but not limited to, cattle, swine, sheep, goats, and deer. The disease is rarely fatal in adult animals, although mortality in young animals may be high. FMD is endemic in Africa, Asia, South America, and parts of Europe but the United States has been free of FMD since 1929. Although it is often not fatal, FMD causes severe losses in the production of meat and milk and therefore has grave economic consequences. FMD does not infect humans or horses, however, both could potentially transmit the virus.

While FMD is primarily an economically devastating disease of livestock, experimental studies have clearly demonstrated that it also threatens wildlife. North American wildlife that are susceptible to FMD include white-tailed deer, other deer species, feral pigs, bison, moose, antelope, musk ox, caribou, sheep, and elk. Most free-living North American wildlife have had no previous exposure to this virus, and there is little information available about their vulnerability (USGS NWHC 2001). Each state in the U.S. is or has developed its own FMD emergency response plan. In the event of FMD outbreak in MO state officials could request assistance from WS.

Pseudorabies (PRV) is a disease of swine that can also affect cattle, horses, dogs, cats, sheep, goats and wildlife. The disease is caused by the pseudorabies virus, an extremely contagious herpes virus that causes reproductive problems, including abortion, stillbirths, and even occasional death in breeding and finishing hogs. The United States is one of the world's largest producers of pork and is the second largest exporter of pork. U.S. pork production accounts for about 10 percent of the total world supply. The retail value of pork sold to consumers exceeds $30 billion annually. In addition, the pork industry supports more than 600,000 jobs. PRV costs U.S. pork producers about $40 million annually in lost production as well as testing and vaccination costs. (USDA 2000a). Psuedorabies in recent years has been found in Iowa, Tennessee, and New Jersey.

Tuberculosis (TB) in livestock caused by *Mycobacterium bovis*. M. bovis has been reported in a wide variety of mammals including cattle, bison, elk, deer and various zoo animals (Davidson and Nettles 1997). Non ruminants including cats, dogs, coyotes and feral swine can also be infected however the ability of some of these species to subsequently shed and spread the virus is unclear. In 1917, the federal government established a bovine TB eradication program. Livestock in most states in the U.S. have been declared free of the disease (USAHA 2004). however, TB has been found in wild white-tailed deer and dairy herds in the Northern Lower Peninsula of Michigan (see section on Impacts on Agriculture below) and the state lost it's TB free status in 2000 (MDA 2004). Loss of TB free status can result in the imposition of quarantines and testing procedures has serious economic impacts on the livestock industry in the affected area. In addition to white-tailed deer and cattle, studies in Michigan have identified TB antibodies in elk, coyotes, raccoons, black bears, bobcats, red foxes and Virginia opossums (MDA 2004). The presence of TB in wildlife populations can complicate and delay efforts to eradicate TB in livestock (Davidson and Nettles 1997).

The domestic cat has been found to transmit the protozoan parasite, *Toxoplasma gondii* to both domestic and wild animal species. Cats have been found to be important reservoirs and the only species known to allow for the completion of the life cycle for *T. gondii* (Dubey 1973; Teutsch et al. 1979). Both stray and domiciled cats may be infected by this protozoan, but this infection is more common in stray cats. Fitzgerald et al. (1984) documented that feral and free-ranging cats transmitted *T. gondii* to sheep in New

Zealand, resulting in abortion in ewes. Dubey et al. (1995) found cats to be 68.3% positive for seroprevalence of *Toxoplasma gondii* on swine farms in Illinois and the major reservoir for this disease. The main sources for infecting cats are thought to be birds and mice. Diseases that may be communicable from free-ranging or feral cats to pet cats include feline panleukopenia (FPL) infection, feline calicivirus (FCV) infection, feline reovirus (FRV) infection, and feline syncytium-forming virus (FSV) infection (Gillespie and Scott 1973). Of the four feline diseases, feline panleukopenia is considered to be the most serious. Reif (1976) found that during the acute stages of feline panleukopenia, fleas were vectors of this disease to other cats. FPL infection is cyclic in nature, being more prevalent in the July to September time period.

Feral swine are potential reservoirs for several diseases and parasites that threaten livestock. Of greatest concern is infection of swine production facilities with diseases like swine brucellosis, pseudorabies, and brucellosis. A study (Corn et al, 1986) conducted in Texas found that feral swine do represent a reservoir of diseases transmissible to livestock. Swine harvested in this study tested positive for pseudorabies, brucellosis, and leptospirosis. Other diseases carried by feral swine include hog cholera, tuberculosis, bubonic plague, and anthrax (Beach 1993). A recent study in Oklahoma (Saliki et al. 1998) found samples also positive for antibodies against porcine parvovirus, swine influenza and the recently emerged porcine reproductive and respiratory syndrome virus (PRRS). PRRS is a highly infectious virus, requiring only a few viral particles to initiate infection (Henry 2003). Classical swine fever is not currently present in the U.S., but outbreaks in other parts of the world and global trade in animals have raised concerns about the possible spread of disease to the U.S. WS could be requested to assist with the collection of blood and tissue samples from feral swine to determine the diseases present in feral swine in Missouri and subsequent risks, if any, to the state livestock industry.

Damage to Agriculture

White-tailed deer damage to agriculture represents a serious negative economic impact to farmers. In Missouri, complaints of deer damage to crops are handled by the MDC which may issue depredation permits. In 2005, 42% of the deer depredation permits were issued for crop damage to soybeans, corn, vineyards, pumpkins, and commercial gardens. Another 32% were issued to control damage to nursery, fruit, and Christmas trees. Of the total complaints received by the MDC in 2005, 37% were concerning crops and 37% were about tree damage. The MDC has regulatory authority over deer, and most complaints are handled by MDC. However WS averages about 4 technical assistance projects per year involving deer damage.

Feral swine are responsible for large scale destruction of crops, hay meadows, and pasture primarily by rooting and wallowing. Rooting is a common activity and is done year-round in search of food (Stevens 1996). The feral hog's rooting and wallowing activities damage pastures and hay meadows, spoil watering holes and can severely damage riparian habitats. Damage to corn, soybeans, and milo field crops results both from direct consumption of crops and feeding related activities (i.e., trampling and rooting).

Voles are reported to damage orchard trees by gnawing. Trees are badly damaged or the bark is girdled and trees die when feeding by rabbits and voles is severe. Similar damage occurs in nurseries which grow Christmas trees and landscape ornamentals and shrubs. Voles also cause damage in alfalfa fields.

Rats cause damage to stored grain through feeding and contamination with droppings. They may damage crops in fields and containers and packaging materials in stored food. They cause structural damage to commodity storage structures and foundations, etc. by burrowing and gnawing.

Missouri's thriving river otter population is the result of an 11-year reintroduction program that reached completion in 1992. The otters have multiplied more rapidly than expected and have proven more adaptable than expected, moving readily from lowland streams into uplands where their appearance

sometimes disturbs pond owners and stream anglers. WS has received reports of damage to catfish fingerlings, ornamental market fish, and food fish by river otters.

Predation and Livestock

Red foxes, gray foxes, coyotes, bobcats, and feral dogs can cause predation losses or injury to livestock (e.g. sheep, goats, cattle, pigs, horses) and poultry (e.g. chickens, turkeys, geese, ducks). Feral swine can be efficient predators. Calves, kids, lambs, and poultry have been known to become prey of feral swine (Stevens 1996, Beech 1993). Sheep and lamb losses from predators in the U.S. totaled 224,200 head and $18.3 million during 2004 (NASS 2005). Coyotes and dogs accounted for 60.5% and 13.3% of these predator losses, respectively. Sheep and lamb producers in Missouri reported losing 200 head of sheep and 900 lambs to coyotes and dogs in 2004 (NASS 2005). In 2005, cattle and calf losses from predators in the U.S. totaled 190,000 head and $92.7 million (NASS 2006).Coyotes and dogs accounted for 51.1% and 11.5% of these predator losses, respectively. Cattle producers in Missouri reported losing 1,400 cows and 4,000 calves to predators in 2005 (NASS 2006). Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they get older and larger (Horstman and Gunson 1982). Although the losses may appear relatively small compared to the total number of animals raised in the state, losses are not evenly distributed among all livestock producers. Impacts on individual producers with damage can be substantial. The impacts on individual producers can be substantial (Shelton 2004).

1.2.3 Need for Mammal Damage Management to Protect Property

In MO during FY 2002- FY 2004, mammal damage to property has been reported to WS involving the following species: white-tailed deer (damage to aircraft, landscaping, and vegetable gardens), raccoons (damage to residential buildings and irrigation systems), coyotes (damage to equipment and golf courses), feral hogs (general property, soil erosion), pocket gophers (turf & flowers), skunks (pets, residential buildings), Virginia opossum (residential buildings), woodchuck (aircraft, general property, golf courses) and other mammal species. The MDC also receives requests from the public in situations where deer, coyotes and other mammals are causing property damage.

Deer browsing damages and destroys landscaping and ornamental trees, shrubs, and flowers. As rural areas are developed, deer habitat may actually be enhanced because fertilized lawns, gardens, and landscape plants serve as high quality sources of food (Swihart et al. 1995). Furthermore, deer are prolific and adaptable, characteristics that allow them to exploit and prosper in most suitable habitat near urban areas, including residential areas (Jones and Witham 1990). The succulent nature of many ornamental landscape plants, coupled with high nutrient contents from fertilizers, offers an attractive food source for deer. In addition to browsing pressure, male white-tailed deer damage ornamental trees and shrubs by antler rubbing which results in broken limbs and bark removal. While large trees may survive antler-rubbing damage, smaller saplings often die or become scarred to the point that they are not aesthetically acceptable for landscaping.

1.2.4 Need for Mammal Damage Management to Protect Natural and Cultural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies for citizens. Such resources may be plants or animals, including threatened and endangered species, historic properties, or habitats in general. Examples of natural and cultural resources in Missouri are historic structures and places; parks and recreation areas; natural areas, including unique habitats or topographic features; threatened and endangered plants or animals; and any plant or animal populations which have been identified by the public as a natural resource.

Examples of mammal damage to natural resources is vegetation at a park which is being damaged by excessive browsing by overabundant white-tailed deer populations, or ground-nesting game bird populations which are being decimated by the presence of mammal predators such as raccoons, coyotes, or foxes. Other instances where mammals may damage or negatively affect natural resources include, but are

not limited to, over browsing by deer in forest habitats, damage to wetland and stream banks by burrowing mammals, and damage to timber, seedlings, and other vegetation in natural areas, parks, and private properties. Feral swine may adversely affect stream ecosystems by causing erosion which increases sedimentation in streams, thereby negatively affecting wildlife that depends on clear water.

Deer overabundance can affect native vegetation and natural ecosystems. White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). These changes can lead to adverse impacts on other wildlife species, which depend on these plants for food and/or shelter. Numerous studies have shown that over browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). For example, in the Great Smokey Mountains National Park in Tennessee, an area heavily populated by deer had a reduction in the number of plant species, a loss of hardwood species and a predominance of conifer species compared to an ecologically similar control area with fewer deer (Bratton 1979). This alteration and degradation of habitat from over-browsing by deer can have a detrimental effect on deer herd health and may displace other wildlife communities (e.g., neotropical migrant songbirds and small mammals) that depend upon the understory vegetative habitat destroyed by deer browsing (VDGIF 1999). Similarly, De Calesta (1997) reported that deer browsing affected vegetation that songbirds need for foraging surfaces, escape cover, and nesting. Species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities (De Calesta 1997). Intermediate canopy-nesting birds declined 37% in abundance and 27% in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer per square mile and another two disappeared at 63.7 deer per square mile. Casey and Hein (1983) found that 3 species of birds were lost in a research preserve stocked with high densities of ungulates and that the densities of several other species of birds were lower than in an adjacent area with lower deer density. Waller and Alverson (1997) hypothesize that by competing with squirrels and other fruit-eating animals for oak mast, deer may further affect many other species of animals and insects.

Feral swine can compete with and prey upon native wildlife and severely damage a variety of habitats. Feral swine are omnivorous and feed on a wide variety of items, many of which are staples for native fauna. One of the more important seasonal food resources used by feral swine is wild fruit and nut crops, especially oak mast (Wood and Roark 1980). Oak mast is also an important food source for deer and wild turkey. When feral swine actively compete for mast, resident deer and wild turkey may enter the winter with inadequate fat reserves, thus threatening the viability of these native wildlife species (Beach 1993). Feral swine also predate native wildlife, especially young and injured wildlife, and ground nesting birds, their nestlings and eggs (Beach 1993). The rooting and foraging behavior of feral swine can completely destroy the understory in forests and make trees less stable during windstorms. Their wallowing and foraging can significantly damage wetlands, which may be important for threatened and endangered (T&E), and sensitive species such as fish.

Need to Protect Natural Resources, Including Wildlife, from Disease.

Chronic wasting disease (CWD) of mule deer, Rocky Mountain elk and white-tailed deer is a disease most commonly believed caused by infectious protein particles, otherwise know as prions. CWD is a member of the group of diseases known as transmissible spongiform encephalopathies (TSEs). Scrapie, "Mad Cow Disease", transmissible mink encephalopathy, and the human variant Creutzfeldt-Jakob disease (CJD) are other known TSEs. In infected animals, the brain takes on a sponge-like appearance and symptoms may include head tremors, walking repetitive courses, wide-based stance, gradual loss of body condition, and excessive drinking, urination, and salivation. Death is inevitable once clinical disease occurs (Doster 2002).

CWD in wild free-ranging deer and elk is known to exist in West Virginia, New York, Colorado, Wyoming, Nebraska, South Dakota, Wisconsin, New Mexico, and Illinois. CWD in game farm elk and deer has been found in, Colorado, Wisconsin, Montana, South Dakota, Oklahoma, Kansas, Nebraska,

Minnesota, Alberta, and Saskatchewan. Although CWD has not been found in Missouri, state and federal agencies are continuing surveillance as captive deer herds still pose a risk factor. There currently is no convincing evidence that CWD affects humans. Public health officials do however recommend that human exposure to CWD be avoided as they continue to evaluate any potential risk.

If CWD were to occur in Missouri, management of CWD would be focused on natural resource protection by controlling/eliminating the spread of the disease to the native Missouri white-tailed deer herd. This work would be coordinated by the MDC, and may include monitoring, biological sampling and research, capture, euthanasia, and/or lethal control of white-tailed deer, as well as other activities. WS involvement in a chronic wasting disease management program in Missouri would be as requested by MDC, and would include use of lethal and non-lethal deer and other wildlife management methods to accomplish disease management and natural resource protection objectives.

Need to Protect Threatened and Endangered Species

Some of the species listed as threatened or endangered under the Federal Endangered Species Act and listed in the Missouri Wildlife Code (3 CSR 10-4.111) are preyed upon or otherwise adversely affected by certain mammal species. Piping plovers (*Charadrius melodus*, federally threatened, state endangered), interior least terns (*Sterna antillarum*, state and federally endangered), barn owls (*Tyto alba*, state endangered) can be negatively affected by raccoons, opossums, striped skunks, cats, rats and other mammals that prey on birds, eat eggs, and cause disturbances on nesting sites. A WS predation management program to protect rare species can be one component of integrated bird enhancement programs that also include nest exclosures, habitat management, management of public access and impacts, and other methods.

Predator damage management can be an important tool for achieving and maintaining game, nongame, and T&E species production and management objectives. Massey (1971) and Massey and Atwood (1979) found that predators can prevent least terns from nesting or cause them to abandon previously occupied sites. In another study, mammal predators were found to have significantly impacted the nesting success of least terns on sandbars and sandpits (Kirsch 1996). Skunks (Massey and Atwood 1979), red foxes (Minsky 1980), coyotes (Grover and Knopf 1982), and raccoons (Gore and Kinnison 1991) are common predators of least terns. During one 2-year study, coyotes destroyed 25.0-38.5% of all interior least tern nests (Grover 1979). Raccoons are considered a major predator of ground-nesting upland bird nests and poults (Speake 1980, Speake et al. 1985, Speake et al. 1969). In Massachusetts, predators destroyed 52-81% of all active piping plover nests from 1985-1987 (MacIvor et al. 1990). Red foxes accounted for 71-100% of the nests destroyed by predators at the site. Balser et al. (1968) recommended that predator damage management programs target the entire predator complex or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986).

In Missouri, feral swine have damaged the federally threatened and state endangered Mead's milkweed by rooting up the plant during feeding. The plant's igneous glade habitat found in the Missouri Ozarks has also been damaged by feral swine rooting activity. Feral swine populations in 3 counties in Missouri utilize riparian areas causing severe damage and sometimes loss to vegetation and stream bank stabilization by their rooting and wallowing. The federally endangered Hine's emerald dragonfly is also directly affected by feral swine. Just recently discovered in Missouri, the dragonfly has an unknown status in the state and is found in Reynolds County located in the Missouri Ozark fen complex. Feral swine utilize these fens to wallow in, frequently causing significant damage. The Hine's emerald dragonfly deposits its eggs in slow moving streams also utilized by feral swine. The federal and state endangered tumbling creek cavesnail's only known population in the world is in Taney County where rooting and wallowing by feral swine in the recharge area of Tumbling creek cave has resulted in increased erosion and increased populations of invasive plant species. The loss of vegetation in these riparian areas leads to increased siltation and chemical runoff which negatively affects all Karst species. This is also true of the federal and state threatened Ozark Cavefish.

1.3 WS RECORD KEEPING REGARDING REQUESTS FOR MAMMAL DAMAGE MANAGEMENT ASSISTANCE

WS maintains a Management Information System (MIS) database to document wildlife damage management assistance provided by WS. MIS data is limited to information that is collected from people who have requested services or information from Wildlife Services. It does not include requests received or responded to by local, State or other Federal agencies, and it is not a complete database for all wildlife damage occurrences. Therefore, the number of requests for assistance to WS does not necessarily reflect the full extent of need for action, but this data does provide an indication that needs exists.

The WS database includes, but is not limited to, the following information: species of wildlife involved, the number of individuals involved in a damage situation; tools and methods used or recommended to alleviate the conflict; and the resource that is in need of protection. Table 1-2 provides a summary of Technical Assistance projects completed by the Missouri WS program for Fiscal Years 2001-2005. A description of the WS Direct Control and Technical Assistance programs is contained in Chapter 3 of this EA. Data presented in this table were taken from Missouri WS Annual Program Reports and represent the number of technical assistance projects conducted by the Missouri WS program and do not include data from operational projects conducted during this period.

Table 1-2. Annual number of incidents for technical assistance involving mammals for Missouri Wildlife Services during 2001-2005.

Fiscal Year	Agriculture	Human Health and Safety	Property	Natural Resources	Total
2001	1	1	0	0	2
2002	3	5	14	1	23
2003	7	8	10	0	25
2004	7	4	4	0	15
2005	63	39	26	2	130
Total	81	57	54	3	195

1.4 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should WS implement an integrated mammal damage management strategy, including technical assistance and direct control, to meet the need for mammal damage management in Missouri?
- If not, should WS attempt to implement one of the alternatives to an integrated mammal damage management strategy as described in the EA?
- Would the proposed action have significant impacts on the quality of the human environment, requiring preparation of an EIS?

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.5.1 Actions Analyzed

This EA evaluates mammal damage management by WS to protect: 1) property; 2) agricultural resources; 3) natural resources; and 4) public health and safety in Missouri. Protection of other resources or other program activities would be addressed in other NEPA analysis, as appropriate.

1.5.2 American Indian Lands and Tribes

Currently, Missouri WS does not have any MOUs with any American Indian tribes. If WS enters into an agreement with a tribe for MDM, this EA would be reviewed and supplemented, if appropriate, to insure compliance with NEPA. MOUs, agreements and NEPA documentation would be prepared as appropriate before conducting MDM on tribal lands.

1.5.3 Period for which this EA is Valid

If it is determined that an EIS is not needed, this EA would remain valid until the Missouri WS program and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient.

1.5.4 Site Specificity

This EA analyzes the potential impacts of MDM and addresses activities on all lands in Missouri under MOUs, Cooperative Agreements and in cooperation with the appropriate public land management agencies. It also addresses the impacts of MDM on areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional MDM efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of mammal damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where mammal damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever mammal damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Missouri (see Chapter 3 for a description of the Decision Model and its application).

The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within the state of Missouri. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.5.5 Summary of Public Involvement

Issues related to the proposed action were initially developed by WS based on experience with similar programs in other parts of the country. As part of WS' Environmental Analysis process, and as required by the Council on Environmental Quality (CEQ 1981) and APHIS-NEPA implementing regulations, this

document has been made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision. The final Decision will be made available to the public via the same methods used for the EA.

1.6 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

ADC Programmatic Environmental Impact Statement. WS, previously called Animal Damage Control (ADC), has issued a Final EIS on the national APHIS/WS program (USDA 1997 Revised). Pertinent and current information available in the EIS has been incorporated by reference into this EA.

Wildlife Damage Management at Airports Environmental Assessment and Finding of No Significant Impact. In 2001, the WS program issued a Finding of No Significant Impact and a Final Environmental Assessment entitled, "*Wildlife Damage Management at Airports in Missouri*," which evaluated alternatives and impacts to the environment and selected an Integrated Wildlife Damage Management (IWDM) approach to manage damage associated with wildlife at airports (USDA 2001). Analysis of alternatives for addressing mammal damage at airports is also covered in this EA. Analysis and alternatives presented in this EA will replace those analyzed in the airport EA.

Management of Aquatic Rodent Damage in Missouri. In, 2005, the WS program issued a Finding of No Significant Impact and a Final Environmental Assessment entitled, "Management of Aquatic Rodent Damage in Missouri " (USDA 2005). The EA analyzed the potential environmental impacts of alternatives for managing damage caused by beaver, nutria and muskrats in Missouri. Management of damage by these species is not included in the scope of this EA on management of mammal damage in Missouri.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Wildlife Services Legislative Authority

WS is the Federal program authorized by law to reduce damage caused by wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). The mission of the USDA/APHIS/WS program is to provide federal leadership in managing conflicts with wildlife. Wildlife Services' mission, developed through its strategic planning process (USDA 1999), is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can cause damage to agriculture and property, pose risks to human health and safety, and affect industrial and natural resources. WS conducts programs of research, technical assistance and applied management to resolve problems that occur when human activity and wildlife conflict.

Additionally, Memoranda of Understanding among WS and other governmental agencies also define WS responsibilities in wildlife damage management. For example, a Memorandum of Understanding between the Federal Aviation Administration (FAA) and WS recognizes WS role and expertise in providing wildlife hazard management assistance to the aviation community. It states, that the "FAA or the certificated airport may request technical and operational assistance from WS to reduce wildlife hazards."

1.7.2 Missouri Department of Conservation (MDC) Legislative Authority

The MDC, under the direction of the Conservation Commission, is specifically charged by the General Assembly with the management of the State's wildlife resources. Many legal mandates of the Conservation Commission and the Department are defined in the Wildlife Code of Missouri, but the

primary statutory authorities include wildlife management, public education, law enforcement, and regulatory powers. Also, MDC has the statutory authority to manage damage to agriculture and property, and to protect human health and safety from damage involving mammals and birds.

1.7.3 Missouri Department of Agriculture (MDA)

The MDA is authorized by RSMO 261.090 to cooperate with "other agencies of the state government dealing with the production, handling and marketing of farm products in the interest of economy, harmony and efficient service and may also cooperate with the USDA and its sub-departments and with other states or organizations that have common agricultural problems with those of the State of Missouri.

1.7.4 Missouri Department of Health (MDH)

The MDH is authorized under RSMO192.020 to safeguard the health of the people in the State of Missouri and all its subdivisions. It shall study the causes and prevention of diseases and designate which diseases are infectious, contagious, communicable, or dangerous, and shall enforce adequate orders, findings, rules and regulations to prevent the spread of such diseases within the State of Missouri. Under RSMO192.110 and the Department of Health regulations, the Public Health Veterinarian shall take cognizance of any contagious diseases which may be prevalent among domestic animals of the state and which may be communicable or transferred to human beings. The State Public Health Veterinarian shall ascertain the nature and cause of such conditions and shall have the power and duty to administer all laws and orders and findings, to quarantine, prevent or to control the spread of such diseases.

1.7.5 Compliance with Federal Laws

Several federal laws regulate WS' wildlife damage management actions. WS complies with these laws and regulations, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. All Federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.). WS follows the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA NEPA implementing regulations (7 CFR 1b), and the APHIS Implementing Procedures (7 CFR 372) as a part of the decision-making process. NEPA sets forth the requirement that Federal actions with the potential to significantly affect the human environment be evaluated in terms of their impacts for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated, in part, by CEQ through regulations in Title 40, Code of Federal Regulations, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis of a proposed Federal action's impact, informs decision-makers and the public of reasonable alternatives, and serves as a decision-aiding mechanism to ensure that the policies and goals of NEPA are infused into Federal agency planning and decision making. An EA is prepared by integrating as many of the natural and social sciences as may be warranted based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). WS conducts Section 7 consultations with the United States Fish and Wildlife Service (USFWS) to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency... is not likely to jeopardize the continued existence of any endangered or threatened species . . . each agency shall use the best scientific and commercial data available" (Sec. 7(a)(2)). WS obtained a Biological Opinion (B.O.) from the U.S. Fish and Wildlife Service describing potential effects of the National WS program

on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997 Revised, Appendix F). WS has completed an informal Section 7 consultation with the USFWS regarding the actions proposed in this EA. The USFWS has concurred with WS' determination that the proposed action either will have no effect on or may effect but is not likely to adversely affect Federally-listed species in Missouri.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The U.S. Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods integrated into the WS program in Missouri are registered with and regulated by the EPA and the MDA and used by WS in compliance with labeling procedures and other requirements.

Executive Order 13112 of February 3, 1999. This order directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To comply with Executive Order 13112, WS may cooperate with other Federal, State, or Local government agencies, or with industry or private individuals to reduce damage to the environment or threats to human health and safety.

Occupational Safety and Health Act of 1970. The Occupational Safety and Health Act of 1970 and its implementing regulations (29CFR1910) on sanitation standards states that, "Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected." This standard includes mammals that may cause safety and health concerns at workplaces.

The Native American Graves and Repatriation Act of 1990. The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

National Historic Preservation Act (NHPA) of 1966 as amended. The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that have the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each of the MDM methods described in this EA that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

There is potential for audible effects on the use and enjoyment of a historic property when methods such as propane exploders, pyrotechnics, firearms, or other noise-making methods are used at or in close proximity to such sites for purposes of hazing or removing animals. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Executive Order 12898, promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental Justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898.

WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. All pesticides used by WS are regulated by the EPA through FIFRA, the Missouri Department of Agriculture, by MOUs with land managing agencies, and by WS Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997 Revised, Appendix P). The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, the proposed action may benefit minority or low-income populations by reducing mammal damage such as threats to public health and safety.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045). Children may suffer disproportionately from environmental health and safety risks for many reasons, including their developmental, physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed mammal damage management program would only occur by using legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360). This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.). This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration

(DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA). The AMDUCA and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in rabies management programs. Those requirements are: (1) a valid "veterinarian-client-patient" relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human within the withdrawal period must be identified. APHIS-WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

1.7.6 Missouri Wildlife Laws, Regulations and Policies Regarding Mammal Damage Management

Owner May Protect Property 3CSR10-4.130

This regulation authorizes landowners or agents of the landowner to protect property, subject to federal regulations, from migratory birds and any other wildlife except deer, turkey, bear and any endangered species which beyond reasonable doubt is damaging property. With the exceptions noted, depredating wildlife may be captured or killed at any time without a permit. Deer, turkey, black bears and endangered species that are causing damage maybe killed only with the permission of an agent of the department, and by methods authorized by the agent.

Missouri Pesticide Laws

The Pesticide Program in Missouri is administered through the Bureau of Pesticide Control in the Plant Industries Division of the Missouri Department of Agriculture. The Bureau administers the Missouri Pesticide Use Act (281.005 - 281.180 RSMO.) which establishes requirements for licenses and provides the authority for enforcement and inspections. The Bureau also administers the Missouri Pesticide Registration Act (281.210-281.310 RSMO.) which gives the bureau the authority for pesticide registration, special local need (Section 24C) registrations, specific exemption (Section 18) registrations, and experimental use permits (EUP).

1.8 PREVIEW OF THE REMAINDER OF THIS EA

The remainder of this EA is composed of four (4) chapters and four (4) appendices. Chapter 2 discusses the issues relevant to the analysis. Chapter 3 contains a description of each alternative, alternatives not considered in detail, and standard operating procedures (SOP) that may be used by WS. Chapter 4 analyzes environmental consequences and the environmental impacts associated with each alternative considered in detail. Chapter 5 contains the list of preparers and those consulted during the EA process. Appendix A is a list of the literature cited during the preparation of the EA and Appendix B is a detailed description of the methods used for MDM in Missouri. Appendix C contains information on the Federal T&E species consultation. Appendix D contains information on the State T&E species consultation.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to the proposed action including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences) and issues not considered in detail, with the rationale. Pertinent portions of the affected environment are included in this chapter and in the discussion of the environmental impacts in Chapter 4.

2.1 AFFECTED ENVIRONMENT

The proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where mammals burrow, feed, or otherwise occur. Examples of areas where mammal damage management activities could be conducted include, but are not necessarily limited to: agricultural fields, orchards, farmyards, dairies, ranches, livestock operations, waste handling facilities, industrial sites, natural areas, government properties and facilities, private homes and properties, corporate properties, schools, hospitals, parks and recreation areas, swimming lakes, communally-owned homeowner/property owner association properties, natural areas, wildlife refuges, wildlife management areas, coastal and tidal beaches, ponds, rivers, and inlets, airports and surrounding areas.

2.2 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on target mammal species
- Effects on other wildlife species, including T&E species
- Effects on human health and safety
- Impacts to stakeholders, including aesthetics
- Humaneness and animal welfare concerns of methods used

2.2.1 Effects on Target Mammal Species

Of interest to WS, program recipients, decision-makers, and members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA include but are not limited to: white-tailed deer, coyotes, raccoons, opossums, mink/weasels, red fox, gray fox, bobcat, feral cats, striped skunk, badger, river otter, woodchuck, nine-banded armadillo, feral swine, domestic/feral dog, brown (Norway) rat, black (roof) rat, house mouse, Eastern cottontail rabbit, swamp rabbit, thirteen-lined ground squirrel, Franklin's ground squirrel, Eastern gray squirrel, fox squirrel, Eastern mole, plains pocket gopher, mice, and voles.

2.2.2 Effects on Non-target Wildlife Species, Including T&E Species

There is concern that the proposed action, or any of the alternatives, could result in adverse impacts on non-target wildlife species, especially state and federally listed threatened and endangered (T&E) species. WS' SOPs are designed to reduce potential impacts on non-target species' populations and are presented in Chapter 3. To reduce the risks of adverse affects to non-target species, WS would select damage management methods that are target-selective or apply MDM methods in ways to reduce the likelihood of capturing or killing non-target species.

Threatened and Endangered species lists for the USFWS and State of Missouri were reviewed to identify potential effects on Federal and State listed T&E species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or SOPs. WS has consulted with the MDC and the USFWS regarding potential risks to T&E species from the actions proposed in this EA (Appendices C and D). WS will comply with all measures recommended by the USFWS and similar precautions requested by the MDC for the protection of State and Federally- listed species.

Some members of the public are concerned that the use of registered toxicants to reduce mammal damage would have adverse impacts on other wildlife species, including T&E species. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997 Revised, Appendix P). WS only uses pesticides that have been approved by the EPA and the MDA and applies these in accordance with the label directions. Under the alternatives proposed in this EA, the primary toxicants proposed for use and recommendation by WS are gas cartridges and zinc phosphide (ZP), strychnine, and anticoagulant rodenticides. Appendix B contains detailed descriptions of these chemical products.

Some MDM programs conducted by WS in Missouri are directed at protection of T&E wildlife species. Operational mammal damage management programs conducted by Missouri WS benefit Mead's milkweed and the tumbling creek cavesnail.

2.2.3 Effects on Human Health and Safety

Safety and efficacy of chemical control methods.

Some individuals may have concerns that chemicals used for wildlife damage management should not be used because of potential adverse effects on people from direct exposure to chemicals or exposure to animals that have died as a result of chemical use.

Under the alternatives proposed in this EA, pesticide products proposed for use by WS are gas cartridges (for rodent control) and zinc phosphide, strychnine, and anticoagulant rodenticides . WS may also provide technical assistance on the use of repellents. Use of these products is regulated by the EPA through FIFRA, the MDA and by WS Directives. The use of registered chemical toxicants and repellants for mammal damage management poses no risk to public health and safety when applied according to label instructions. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997 Revised, Appendix P). Chemical pesticides that have come into use since the Risk Assessment was completed have undergone considerable environmental review through EPA and State registration processes, which means they have been found to present no unreasonable risk to the environment or human health and safety when used according to label directions." WS personnel who apply pesticides are certified pesticide applicators and apply pesticides according to label instructions. A detailed description of these chemicals is contained in Appendix B.

WS also uses FDA registered chemicals for animal immobilization and euthanasia. Some individuals are concerned that the drugs used in animal capture, handling, and euthanasia may cause adverse health effects in humans that hunt and eat the species involved.

Impacts on human safety of non-chemical MDM methods

Some people may be concerned that WS' use of firearms, traps, snares and pyrotechnic scaring devices could cause injuries to people. WS personnel occasionally use traps, snares and firearms

to remove mammals that are associated with damage. There is some potential fire hazard to agricultural sites and private property from pyrotechnic use.

Firearm use is a very sensitive issue and a concern because of public fears regarding the risks associated with unsafe firearms use and the threat of misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Impacts on human health and safety from mammals

The concern stated here is that the absence of adequate MDM would result in adverse effects on human health and safety, because mammal damage would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries, illness, or loss of human lives.

2.2.4 Impacts to Stakeholders, including Aesthetics

Aesthetics is a philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is subjective in nature and is dependent on what an observer regards as beautiful. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. There may be some concern that the proposed action or alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception, and today a large percentage of households have pets. Some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals. Others may experience anxiety or fear when wild animals come into close proximity to their homes and families. Therefore, it is not surprising that the public reaction to wildlife damage management techniques is mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife.

Many people, directly affected by problems and threats to public health or safety associated with mammals may insist upon removal of the animal(s) from the property or public location when they cause damage. Some members of the public have an idealistic view and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Others, directly affected

by the specific wildlife "problem", may not agree that there is a problem. They may perceive that the issue at hand is normal animal behavior and a consequence of living in proximity to nature and should be tolerated. Similarly, individuals not directly affected by the harm or damage caused by wildlife may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Individuals totally opposed to mammal damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some people would strongly oppose removal of mammals regardless of the amount and type of damage. Advocates of the Animal Rights philosophy believe that animals are entitled to the same rights and protections as humans and that if an action is unacceptable treatment for a human it is unacceptable treatment for an animal. Some members of the public who oppose removal of wildlife do so because of human-affectionate bonds with individual animals. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

The WS program in Missouri would only conduct wildlife damage management at the request of the affected property owner or resource manager. If WS received requests from an individual or official for MDM, WS would address the issues/concerns and consideration would be made to explain the advantages and disadvantages of the available damage management actions available. Management actions would be carried out in a caring, humane, and professional manner.

2.2.5 Humaneness and Animal Welfare Concerns of Methods Used

Humaneness, in part, is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently.

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if "*. . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*" Suffering is described as a "*. . . highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*. . . can occur without pain . . . ,*" and "*. . . pain can occur without suffering . . .* " (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for "*. . . little or no suffering where death comes immediately . . .* " (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "*. . . probably be causes for pain in other animals . . .* " (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (CDFG 1991).

The AVMA states "*... euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness.*" (AVMA 2001). Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The AVMA states that "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible.*" (AVMA 2001).

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. For example, some individuals may perceive techniques used to remove a predator that is killing or injuring pets or livestock as inhumane, while others may believe it is equally or more inhumane to permit pets and livestock that depend upon humans for protection to be injured or killed by predators. One challenge with coping with this issue is how to achieve the least amount of animal suffering within the constraints of current technology and

resources. WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some MDM methods are used in situations where non-lethal damage management methods are not practical or effective.

Missouri WS personnel are experienced and professional in their use of management methods so that they are humane within the constraints of current technology and resources. Standard operating procedures used to maximize humaneness are described in Chapter 4.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 No Wildlife Damage Management at Taxpayer Expense; Wildlife Damage Management should be Fee Based

Funding for WS comes from a variety of sources in addition to federal appropriations. In Missouri, funds to implement wildlife damage management activities and programs are derived from a number of sources, including, but not limited to Federal, state, county and municipal governments/agencies, private organizations, corporations and individuals, homeowner/property owner associations, and others, under Cooperative Service Agreements and/or other contract documents and processes (Missouri WS state report http://www.aphis.usda.gov/ws/pdf/missouri.pdf,) Federal, state, and local officials have decided that wildlife damage management should be conducted by appropriating funds. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Wildlife damage management is an appropriate sphere of activity for government programs, since aspects of wildlife damage management are a government responsibility and authorized and directed by law.

2.3.2 Mammal Damage Should be Managed by Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce mammal damage for property owners or property owners could attempt to reduce their own damage problems. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden. The relationship between WS and private industry is addressed in WS directive 3.1.1 (http://www.aphis.usda.gov/ws/directives/3101.pdf).

2.3.3 Appropriateness of Preparing an EA (Instead of an EIS) for Such a Large Area

Some individuals might question whether preparing an EA for an area the size of the State of Missouri would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EAs covering smaller zones. In addition, the WS program in Missouri only conducts MDM on a relatively small area of the State where damage is occurring or likely to occur.

2.3.4 Effectiveness of Mammal Damage Management Methods

A concern among members of the public is whether the methods of reducing mammal damage will be effective in reducing or alleviating damage and conflicts. The effectiveness of each method or methods can be defined in terms of decreased potential for health risks, decreased human safety hazards, reduced property damage, reduced agricultural damage, and reduced natural resource damage. In terms of the effectiveness of a specific method or group of methods, this would not only be based on the specific method used, but more importantly upon the skills and abilities of the person implementing the control

methods and the ability of that person to determine the appropriate course of action to take. It would be expected that the more experience a person has in addressing mammal damage conflicts and implementing control methods the more likely they would be in successfully reducing damage to acceptable levels. The WS technical assistance program provides information to assist persons in implementing their own MDM program, but at times the person receiving WS technical assistance may not have the skill or ability to implement the MDM methods recommended by WS. Therefore, it is more likely that a specific MDM method or group of methods would be effective in reducing damage to acceptable levels when WS professional wildlife damage assistance is provided than that would occur when the inexperienced person attempts to conduct MDM activities.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of seven parts: 1) introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action (Alternative 2), 3) mammal damage management approaches used by WS, 4) mammal damage management methods that could be authorized for use or recommended by WS, 5) methodologies deemed unavailable, impractical, ineffective, or unsafe at the present time, 6) a description of alternatives considered, but eliminated from detailed analysis, and 7) standard operating procedures. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), Methods of Control (USDA 1997 Revised), and "*Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program*" (USDA 1997 Revised).

Four alternatives were recognized, developed, and analyzed in detail. An additional three alternatives were considered, but not analyzed in detail. The five alternatives analyzed in detail are:

Alternatives analyzed in detail are:

- Alternative 1: Technical Assistance Only.
- Alternative 2: Integrated Mammal Damage Management Program. (Proposed Action/No Action)
- Alternative 3: Non-lethal Mammal Damage Management Only By WS
- Alternative 4: No federal WS Mammal Damage Management.

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1: Technical Assistance Only

This alternative would not allow for WS operational MDM in Missouri. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, corporations, or others could conduct MDM using any legal lethal or non-lethal method available to them.

3.1.2 Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with guidance from the CEQ (CEQ 1981). In this guidance, the No Action alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity.

WS proposed to continue the current damage management program that responds to mammal damage in Missouri. WS involvement in mammal damage management in Missouri is closely coordinated with the MDC, and WS take of mammals is authorized through permits and/or other authorities granted by the MDC. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce mammal damage to property, agricultural resources, and natural resources, and to reduce mammal impacts on human/public health and safety. Damage management would be conducted on public and private property in Missouri when the resource owner (property owner) or manager requests assistance. The IWDM strategy would encompass the use and recommendation of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate non-lethal techniques

like physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, mammals would be removed as humanely as possible using shooting, trapping, and registered pesticides and other products. Preference would be given to practical and effective non-lethal methods, but, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy.

3.1.3 Alternative 3: Non-lethal Mammal Damage Management Only by WS

This alternative would restrict WS to using and recommend non-lethal methods to resolve mammal damage problems. Information on lethal MDM methods would still be available to producers and property owners through other sources such as the MDC, USDA Agricultural Extension Service offices, universities, or pest control organizations. Requests for information regarding lethal management approaches would be referred to these entities. Individuals might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS direct assistance with non-lethal MDM, use contractual services of private businesses, or take no action. Persons receiving WS' non-lethal technical and direct control assistance could still resort to lethal methods that were available to them.

3.1.4 Alternative 4: No Federal WS Mammal Damage Management

This alternative would eliminate WS involvement in MDM in Missouri. WS would not provide direct operational or technical assistance and requesters of WS' assistance would have to conduct their own MDM without WS input. Information on MDM methods would still be available to producers and property owners through other sources such as the MDC, USDA Agricultural Extension Service offices, universities, or pest control organizations. Requests for information would be referred to these entities. Individuals might choose to conduct MDM themselves, use contractual services of private businesses, or take no action.

3.2 MAMMAL DAMAGE MANAGEMENT STRATEGIES USED BY WS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2 and 3 described above. Alternative 4 would terminate both WS technical assistance and operational MDM by WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in the most cost-effective[3] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 The IWDM Strategies Employed by WS

Technical Assistance Recommendations
"Technical assistance" as used herein is information, demonstrations, and advice on available and

[3] The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

appropriate wildlife damage management methods and approaches. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for use by non-WS entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor by WS results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended.

Under APHIS NEPA implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving mammal damage problems.

Direct Damage Management Assistance (Direct Control)
Direct damage management assistance includes damage management activities that are directly conducted or supervised by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when *Agreements for Control* or other comparable instruments are provided for direct damage management by WS. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary or if the problems are complex.

Educational Efforts
Education is an important element of WS program activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures, courses, and demonstrations are provided to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development
The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

Examples of WS Direct Operational and Technical Assistance in MDM in Missouri

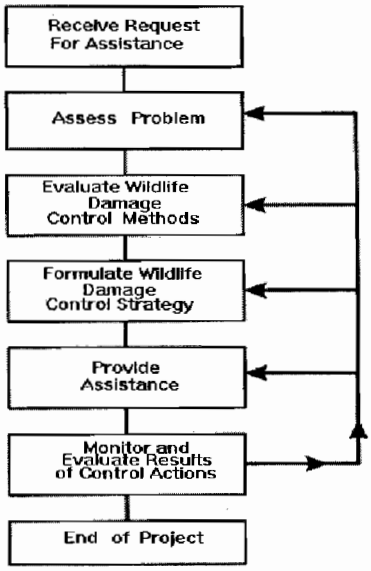
- WS has entered into agreements with municipal and military airports in Missouri to assess, manage, and monitor wildlife-related public safety and aviation hazards. Mammal-aircraft strikes and hazards involving white-tailed deer, red fox, coyotes, raccoons, woodchucks, and other mammals have created safety hazards at Missouri airports. WS has implemented an IWDM approach consisting of technical assistance and direct control components including: WS review of airport development and landscaping plans, habitat management recommendations, provision of training to airport personnel, hazardous mammal and population management, and exclusion. WS involvement at Missouri airports has considerably reduced or prevented strikes with hazardous mammal species at the airport.

- The MDC, MDA, MDH, University of Missouri Extension (UME), and WS have entered into a MOU to establish a cooperative relationship between the agencies for planning, coordinating, and implementing wildlife damage management policies to prevent or minimize damage from wild animal species, and to facilitate information exchange between the agencies. As a direct result of this MOU, WS has the primary responsibility for responding to complaints involving federally protected species, airport/wildlife conflicts and conflict associated with public lands. The Feral Hog Task Force was formed to enable multi-jurisdictional response in damage situations involving feral swine.

3.2.3 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model and described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate to reduce damage. WS personnel assess the problem then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions.

Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.



3.3 MAMMAL DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE (See Appendix B for a more detailed description of each method or approach.)

3.3.1 Non-lethal Methods

Non-lethal methods are often used by the cooperators before and/or after requesting assistance from WS. It is not unusual for cooperators to have already tried non-lethal methods prior to requesting assistance from WS. In a 2005 NASS Nationwide survey of cattle producers, Missouri cattle producers reported using livestock guarding animals (57.4%), exclusion fencing (21.9%), frequent checking (15.5%), culling of sick/injured animals (12.5%), livestock carcass removal (11%), herding (5.4%), frightening devices (1.5%), night penning (1.1%) and other non-lethal methods (4.6%), to prevent predation losses (NASS 2006). In a similar 2004 survey, sheep producers, reported using guard dogs (40.8%), night penning (34.2%), guard llamas (22.5%), fencing (20.9%), shed lambing (9.9%), guard donkeys (7.2%), frequent checks (5.9%), herding (5.7%), culling of sick/injured animals (<1%), changing bedding (<1%), carcass removal (<1%), and other methods (1%) to prevent predation losses (NASS 2005).

Exclusion prevents wildlife access to protected resources through fencing, netting, or other physical barriers.

Cultural methods and habitat modifications are typically implemented by agricultural producers or property owners. They consist primarily of non-lethal preventive methods which minimize exposure to and/or reduce the amount or attractiveness of the protected resource to wildlife that would cause damage or pose a threat. A few examples of these types of techniques are: planting lure crops, providing alternate foods, changing animal husbandry practices, switching to short variety crops, picking less palatable varieties of landscape plants, providing raptor perching poles, and keeping the vegetation around the protected resource short.

Animal behavior modification refers to tactics that alter the behavior of mammals to reduce damage. Some but not all of these tactics include the following:

- Propane exploders
- Pyrotechnics
- Distress calls and sound producing devices
- Visual repellents and other scaring tactics
- Livestock guarding animals

Live capture and release is through use of cage traps designed to capture mammals alive. Captured target mammals can then be relocated to other field locations or to animal shelters, pursuant to State laws and regulations. Alternatively, when monitoring for diseases in wildlife, samples may be collected and then the animal is released at the capture site.

Capture Devices including foot-hold traps, corral traps and box/cage traps are used to capture wildlife. Snares can also be modified to live-capture animals. These devices hold the animal until the wildlife specialist arrives and relocates the animal. These devices can be used as lethal methods if the specialist euthanizes the captured animals via gunshot or euthanasia chemicals discussed below.

Repellents are usually naturally occurring substances that are chemically formulated to be distasteful or to elicit pain or discomfort to target animals when they are encountered.

Drugs such as anesthetics (Ketamine, Telazol), sedatives (analgesics) (Xylazine), and accessory drugs (Yohimbine, antibiotics, etc.) are used to capture, sedate, and handle animals involved in wildlife damage or disease situations. These and other drugs are available for WS use, pursuant to State and Federal regulations, and are identified as approved drugs by the WS program through its Immobilization and Euthanasia Committee.

3.3.2 Lethal Methods

Capture Devices, including body-gripping traps (Conibear), snap traps, and snares kill the animal captured. Non-lethal capture devices as discussed above can also be used as lethal methods when the captured animal is killed via shooting or euthanasia chemicals.

Shooting is helpful in some situations to supplement and reinforce other dispersal techniques and to kill mammals that are legally trapped. It is selective for target species and may be used in conjunction with the use of spotlights, calling, and other alternative legal tools (elevated positions, stands, etc.). Shooting with firearms is sometimes used to manage mammal damage problems when lethal methods are determined to be appropriate. The animals are killed as quickly and humanely as possible.

Sport harvest through hunting and trapping is often an important part of MDM strategies and is recommended by WS to enhance the effectiveness of other damage management techniques and to accomplish population management objectives developed by the MDC.

Toxicants such as gas cartridges, zinc phosphide, strychnine and anticoagulant rodenticides (Appendix B) may be used and recommended to lethally control mice, voles, rats, pocket gophers, woodchucks, and other mammals associated with damage. Label directions are followed, and application by WS occurs at specific sites, pursuant to landowner requests and all pertinent laws, regulations, and policies.

Carbon dioxide (CO_2) gas is an AVMA-approved euthanasia method (AVMA 2001) which is sometimes used to euthanize mammals that have been chemically immobilized or captured in live traps. Live animals are placed in an enclosed space into which CO_2 gas is released. The animals quickly expire after inhaling the CO_2.

Euthanasia agents (Sodium Pentobarbital and its derivatives, Potassium Chloride) are used euthanize animals involved in wildlife damage or disease situations. These and other drugs are available for WS use, pursuant to State and Federal regulations, and are identified as approved drugs by the WS program through its Immobilization and Euthanasia Committee.

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered, but not analyzed in detail. These were:

3.4.1 Lethal Mammal Damage Management Only By WS

Under this alternative, WS would not conduct any non-lethal control of mammals for MDM purposes in the State, but would only conduct lethal MDM. This alternative was eliminated from further analysis because some mammal damage problems can be resolved effectively through non-lethal means. Additionally, lethal methods may not always be available for use due to safety concerns or local ordinances prohibiting the use of some lethal methods, such as the discharge of firearms.

3.4.2 Compensation for Mammal Damage Losses

The compensation alternative would require the establishment of a system to reimburse persons impacted by mammal damage. This alternative was eliminated from further analysis because no federal or state laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative in the ADC Final EIS indicated that the concept has many drawbacks (USDA 1997 Revised):

- It would require larger expenditures of money and labor to investigate and validate all damage claims to determine and administer appropriate compensation.

- Compensation would most likely be less than full market value. Responding in a timely fashion to all requests to assess and confirm damage would be difficult and certain types of damage could not be conclusively verified. For example, proving conclusively in individual situations that mammals were responsible for disease outbreaks would be impossible, even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses.

- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.

- Not all resource owners would rely completely on a compensation program and unregulated lethal control would most likely continue as permitted by state law.

- Compensation would not be practical for reducing threats to human health and safety.

3.4.3 Reproduction Control

Reproductive control is often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (longevity, age at onset of reproduction, population size and biological/cultural carrying capacity, etc.), habitat and environmental factors (isolation of target population, cover types and access to target individuals, etc.), socioeconomic and other factors. Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, requirements for repeated treatments with some contraceptive products, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Research into reproductive control technologies, however, has been ongoing, and the approach will probably be considered in an increasing variety of wildlife management situations.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible).

Sterilization could be accomplished through:

- Surgical sterilization (vasectomy, castration, and tubal ligation),
- Chemosterilization
- Gene therapy.

Contraception could be accomplished through:

- Hormone implantation (e.g., synthetic steroids such as progestins)
- Immunocontraception (e.g., contraceptive vaccines)
- Oral contraception (e.g., progestin administered daily).

Research into the use of these techniques consists of laboratory/pen experimentation to determine and develop the sterilization or contraceptive material or procedure, field trials to develop the delivery system, and field experimentation to determine the effectiveness of the technique in achieving population reduction. Prior to implementation, the product must be registered and approved by the appropriate federal and state regulatory agencies.

The use of hormones was investigated (Matschke 1976, 1977 a, b, c, Roughton 1979), and eventually rejected as an effective and efficient reproductive control technique for deer. Additionally, concerns related to costs and logistics of widespread distribution of drugged baits, dosage control and ingestion of baits by children and non-target animals make oral contraception (by steroids) largely impractical (Lowery et al. 1993). More recently, immunocontraception has been studied in various situations and locations, but its potential use appears limited due to considerable constraints regarding treatment and follow-up treatment of a sufficiently large number of target animals, varying immunogenecity of vaccines, genetic backgrounds of individual animals, age, nutritional status, stress and other factors (Becker and Katz 1997, Becker et al. 1999). Immunocontraceptive vaccines prevent conception by stimulating the production of antibodies that bioneutralize proteins or hormones essential for reproduction (Miller et al. 2000). The use of porcine zona pellucida (PZP) as a contraceptive agent in wildlife management has been investigated recently (Kirkpatrick et al. 1990, Turner and Kirkpatrick 1991, Turner et al. 1992 and 1996), but to date, there is no published documentation that immunocontraceptive vaccines have successfully reduced any free-ranging deer herd or population. Additionally, Underwood and Verret (1998) reported that despite 5 years of PZP treatment, the Fire Island, NY white-tailed deer population continued to grow, albeit at a slower rate.

Other components of the reproductive system have been studied for immunocontraception as well, such as GnRH (Becker and Katz 1997, Becker et al. 1999). The USDA/APHIS/WS National Wildlife Research

Center (NWRC) has been instrumental in the development of a single-injection GnRH immunocontraceptive vaccine (GonaCon™) which has been shown to provide contraceptive effects lasting up to 2 years without needing booster vaccination (Miller and Killian 2001, NWRC 2004). The NWRC is working with the Food and Drug Administration to obtain registration of this product for use as a new animal drug. Although the GnRH immunocontraceptive appears promising, it has limitations. GnRH has been documented to have adverse impacts on antler growth in male deer (Miller and Killian 2001). If true, then it may be necessary to determine a way to only treat female deer or application may be limited to fenced-in sites where shifts in antler growth will not have as great an impact on the recreational and aesthetic value of the deer, or areas where cooperators have decided that the reduction in reproduction is worth the cost of altered antler growth in bucks (Killian et al. 2005).

Canadian researchers at Dalhousie University (Halifax, Nova Scotia) investigated the use of a single-dose immunocontraceptive vaccine based on liposome delivery of PZP antigens (Spay Vac ™), and reported a 90% reduction in pup production by gray seals (*Halichoerus grypus*) (Brown et al. 1997). Fraker et al. (in press) reported that fertility of an island population of fallow deer (*Dama dama*) was greatly reduced by a single administration of Spay Vac ™ during the first year of treatment. However, Spay Vac ™ has failed in field trials in Princeton, CT and the manufacturer has stated that it will discontinue efforts to register the product with the U.S. Food and Drug Administration for the time being (Campbell 2005).

Turner et al. (1993) note that although contraception in white-tailed deer may be used to limit population growth, it will not reduce the number of animals in excess of the desired level in many circumstances. They further contend that initial population reductions by various other means may be necessary to achieve management goals, and that reproduction control would be one facet of an integrated program. In sum, although immunocontraceptive technology has been variously effective in laboratories, pens, and in island field applications, it has not been effective in reducing populations of free-ranging white-tailed deer.

Development of a single-shot sterilization technique as an alternative to immunocontraception was investigated by Rutgers University scientists in 2000. One possible approach is gene therapy which could accomplish reproductive control via sterilization through producing death of the anterior pituitary cells that synthesize luteinizing hormone (LH), which triggers ovulation in females and spermatogenesis in males. Efficacy testing and development of a delivery system will be investigated over the next few years.

The use of reproductive control is subject to Federal and State regulation. Additionally:

- No chemical or biological agent to accomplish reproductive control for free-ranging mammals has been approved for operational use by Federal and Missouri authorities.
- If an effective tool was legally available, and if the project area was fenced, it would still take many years for some mammal populations to stabilize at a lower level, and ongoing damage would continue to occur at unacceptably high levels, and
- There are considerable logistic, economic and socio-cultural limitations to trapping, capturing and chemical treatment of the hundreds or thousands of mammals that would be necessary to affect an eventual decline in the population.

Because there is no tool currently available for field application, and due to considerable logistic, economic, and socio-cultural limitations to the use of fertility control on free-ranging mammals, this approach is not considered for further analysis in this EA. However research into this area of wildlife damage management continues. WS will monitor new developments and, where practical and appropriate, could incorporate this technique into its program after necessary NEPA review is completed.

3.5 STANDARD OPERATING PROCEDURES FOR MAMMAL DAMAGE MANAGEMENT TECHNIQUES

3.5.1 Standard Operating Procedures (SOPs)

The current WS program, nationwide and in Missouri has developed SOPs for its activities that reduce the potential impacts of these actions on the environment. These procedures are discussed in detail in Chapter 5 of the ADC Final EIS (USDA 1997 Revised). Some key standard operating procedures pertinent to the proposed action and alternatives of this EA include:

- The WS Decision Model thought process is used to identify effective wildlife damage management strategies and their effects.

- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid effects to T&E species.

- EPA-approved label directions are followed for all pesticide use, storage and disposal. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.

- All WS personnel in Missouri using restricted chemicals and controlled substances (immobilization and euthanizing drugs) are trained and certified by, or operate under the direct supervision of, program personnel or others who are trained in the safe and effective use of chemical MDM materials. Management controls are in place within WS and its Immobilization and Euthanasia Committee to maintain personnel training and certification.

- WS employees who use pesticides participate in continuing education programs to keep abreast of developments and to maintain their certifications issued by the MDA.

- Research is being conducted to improve MDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate non-target hazards and environmental effects of MDM techniques

3.5.2 Additional SOPs Specific to the Issues

The following is a summary of additional SOPs that are specific to the issues listed in Chapter 2 of this document.

- Management actions would be directed toward localized populations or groups of target species and/or individual offending members of those species. Generalized population suppression across the State, or even across major portions of the State, would not be conducted.

- WS take of target and non-target species is monitored by considering "Total Harvest" and estimated population numbers of key species. These data are used to assess cumulative affects so as to maintain the magnitude of harvest below the level that would impact the viability of a population (See Chapter 4).

- WS uses MDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997 Revised, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

- WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding non-target take.

- WS has consulted with the USFWS regarding potential effects of the National WS program methods on T&E species and abides by reasonable and prudent alternatives (RPAs) and/or reasonable and prudent measures (RPMs) established as a result of that consultation. For the full context of the Biological Opinion, see the ADC Final EIS, Appendix F (USDA 1997 Revised). WS has also consulted with the USFWS regarding the actions proposed in this EA and will comply with all USFWS recommendations for the protection of Federally-listed T&E species.

- WS is consulting with the MDC regarding potential effects of mammal damage management on State-listed threatened and endangered species. WS will adhere to all recommendations and requests from the MDC for the protection of State-listed species.

- WS uses chemical methods for MDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.

- All WS actions are conducted in accordance with applicable state, federal and local laws, including regulations mandating that traps be checked daily, except underwater killing traps which must be checked every 48 hours.

- WS policy (2.45) requires that appropriate warning signs be posted on main entrances or commonly used access points to areas where foothold traps, snares or rotating jaw (conibear-type) traps are in use.

- Traps and snares are not set within 30 feet of exposed carcasses to prevent the capture of scavenging birds.

- Foothold trap underpan tension devices are used throughout the program to reduce capture of non-target wildlife that weighs less than the target species.

- Non-target animals captured in foothold traps or foot snares are released unless it is determined by the WS Specialists that they will not survive.

- WS personnel are highly trained and experienced to select the most appropriate method for taking problem animals and excluding non-target animals.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. The environmental consequences of each alternative are analyzed in comparison with the no action alternative (Alternative 2) to determine if the real or potential effects would be greater, lesser, or the same.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, visual resources, air quality, prime and unique farmlands, timber, and range. These resources will not be analyzed further.

Cumulative Effects: Cumulative effects are discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including T&E species.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Effects on sites or resources protected under the National Historic Preservation Act: WS MDM actions are not undertakings that could adversely affect historic resources (See Section 1.8.3).

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

4.1.1 Effects on Target Mammal Species Populations

4.1.1.1 Alternative 1: Technical Assistance Only

Under this alternative, WS would have no impact on target mammal populations in the State because the program would not provide any operational MDM activities. The program would be limited to providing advice only. Private efforts to reduce or prevent mammal damage and perceived disease transmission risks could increase. Cumulative impacts on target species populations would be variable depending upon actions taken by affected landowners/resource managers and the level training and experience of the individuals conducting the MDM. Some individuals experiencing damage may take illegal or unsafe action against the problem species either unintentionally due to lack of training, or deliberately out of frustration of continued damage. In these instances, more target species may be taken than with a professional WDM program (Alternatives 2). Risks associated with improper use of MDM methods would be lower than for Alternative 4 because people would have access to technical assistance from WS. For the same reasons shown below in the population effects analysis in section 4.1.1.2, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

4.1.1.2 Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997 Revised). Magnitude is described in USDA (1997 Revised) as "*. . . a measure of the number of animals killed in relation to their abundance.*" Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on

population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. Table 4-1 identifies the number of animals taken by WS during CY2003-CY2005.

Table 4-1. Number of animals intentionally taken (killed, freed, relocated, dispersed) by WS during mammal damage management activities.

Species	Wildlife Services' Take (K=killed, F/R=freed/relocated, D=dispersed)								
	2003			2004			2005		
	K	F/R	D*	K	F/R	D*	K	F/R	D*
Bobcat	2	0	0	1	0	0	1	0	2
Badger	1	0	0	1	0	0	0	0	0
Bat	0	1	0	0	0	1	0	0	0
Cottontail rabbit	3	0	0	2	1	0	46	0	3
Coyote	12	0	5	22	0	14	20	0	20
Deer mouse	0	0	0	25	0	0	0	0	0
Fox Squirrel	1	0	0	0	0	0	0	0	0
Gray Squirrel	0	0	0	0	1	0	0	0	0
Mink	1	0	0	0	0	0	0	0	0
Raccoon	74	5	2	79	12	1	73	13	0
Red fox	12	0	2	3	0	2	3	0	5
River otter	0	0	0	3	0	0	0	0	0
Striped skunk	15	3	60	24	0	0	17	0	3
Virginia opossum	32	6	4	32	4	0	42	5	0
Vole	0	0	0	54	0	0	0	0	0
Weasel	0	0	1	0	0	0	0	0	0
White-tailed deer	66	0	58	72	0	22	128	0	15
Woodchuck	2	1	0	1	0	2	4	0	1
Feral cat	2	8	3	7	9	5	20	12	5
Feral dog	0	1	5	0	0	18	1	0	8
Feral hog	4	0	0	11	0	0	21	0	0

*. This is only the number of animals harassed/dispersed by WS employees. Non-lethal techniques like harassment are often performed by the cooperator with only technical assistance from WS. The WS database does not include information on the number of animals harassed by cooperators so this data does not represent the full extent to which harassment has been used.

White-Tailed Deer

The MDC is responsible for the management and monitoring of the state's white-tailed deer. Overall, the state's deer population is healthy and productive (L. Hansen, MDC, pers. comm.). The state monitors the deer population through the use of through management units using spotlight counts and harvest data. MDC has divided the state in to 59 deer management units. Populations vary from unit to unit depending on the quality of habitat. Deer are present in most of the management units, and occupy almost all undeveloped land that contains suitable deer habitat. The statewide deer population is estimated at approximately 1 million. Although the state wide deer population has remained relatively stable for the past several years, significant increases in local areas have occurred. These increases are likely due to a number of factors, including 1) Poor hunter access to land occupied by deer, 2) Local and state ordinances limiting hunting and/or discharge and use of firearms and bows, and 3).Improved habitat and better management practices.

In Missouri, there are approximately 8,648 deer-vehicle collisions each year, with many collisions and near misses going unreported (L. Hansen, MDC, pers. comm.).

To date, the majority of WS' involvement in deer damage management has been primarily at airports. WS' work at airports in Missouri has resulted in the lethal removal of 66 white-tailed deer in CY 2003, 72 deer in CY 2004 and 128 deer during CY 2005. WS may also conduct deer damage management activities to protect property, natural resources, public and animal health and safety, including deer damage management in high security areas such as electrical plants and industrial facilities, agricultural facilities, research facilities, and municipalities where licensed hunting may not be allowed. For example, WS has provided technical assistance to a resort complex where an overabundance of deer has created browse lines, landscaping damage and increased risk of deer vehicle collisions. Chronic Wasting Disease (CWD) has not been detected in Missouri, however, in the event CWD or another disease is detected in deer, WS could be requested by MDC to assist in sampling or removing deer from an infected area.

Cumulative annual take of deer in Missouri by licensed hunters was 288,443 deer in the 2003-2004 hunting season, 312,975 deer in 2004-2005 season, and 286,027 deer in 2005-2006 season. In addition to licensed hunting, the MDC issues special depredation permits primarily for deer damage to crops and trees. The local conservation or wildlife damage biologist will inspect the property and issue a permit for a reasonable number of deer to be taken. This generally will range from 5 to 20 deer. The state has no central record keeping on how many deer are taken with depredation permits.

For the period of 2003-2005, deer damage management actions by WS accounted for less than 0.05% of the known total annual take in the state for these years. Based upon an anticipated increase in requests for assistance with deer damage management, WS' lethal take of white-tailed deer in Missouri would be expected to be no more than approximately 1,000 animals in any one year under the Proposed Action. Annual take of 1,000 deer is approximately 0.34% of the average annual sport take from 2002 to 2004 (295,815 deer). WS' actions may result in localized reductions in deer density. However, considering the reproductive capacity of deer, the relatively high density of deer and the state, and the high mobility of deer, these reductions would only be short-term. Given the above information and MDC oversight, WS' limited lethal take of deer in Missouri should have minimal effects on local or statewide white-tailed deer populations.

Furbearers

The MDC is responsible for the management of the state's furbearers including raccoons, coyotes, red fox, striped skunks, Virginia opossums, badgers, river otters and bobcats. At this time MDC does not conduct population census for most of these species, but does monitor the sale of hides. The MDC also requires registration of all river otters and bobcats taken by licensed hunters. Estimated fur harvest for target species in this EA are provided in Table 4-2. Coyotes may be hunted at any time during the year and there is no limit on the number of individuals that may be taken. Coyote trapping is restricted to a set season but there is no limit on the number of animals that may be taken. Hunting and trapping badgers, bobcats, gray fox, red fox, opossum, raccoon, striped skunk and river otters is restricted to set seasons. For all of these species except river otter, there is no limit on take. There are possession limits for most river otter management zones.

Wildlife Services' proposed maximum annual lethal take for each of these species is provided in Table 4-2. State population estimates are available for Virginia opossums (2-3 million animals), coyotes (60,000-120,000), red foxes (10,000-20,000), raccoons (1.5-2.5 million), mink (10,000-20,000), river otters (15,000), and bobcats (15,000-18,000). WS' proposed take for these species is 1% or less of the estimated population for these species. WS' estimated maximum annual take is less than 5 percent of recent estimated annual removal by licensed hunters/trappers for all species except river otter (8%), striped skunk (30%) and badgers (30%). Impact analyses in the WS programmatic EIS (USDA 1997 Revised) determined that if WS' take is less than 33% of

total allowable harvest then the magnitude of impact on the target species population is considered to be low. Additionally, the target species populations for all species except river otters are sufficiently healthy that the MDC has not established bag limits on the capture of these species. Given these factors, that WS' lethal take of these species is limited in scope and number, and that WS actions are conducted under the supervision of the MDC, the proposed action will not adversely impact state populations of furbearers.

Table 4-2. Annual lethal take of furbearers in Missouri for the period of 2002/03 through 2004/05.

Species	Licensed Take[1]			WS Lethal Take			Maximum Proposed WS Annual Take
	2002-2003	2003-2004	2004-2005	2002	2003	2004	
Bobcat	2,513	2,783	3,701	2	1	1	50
Badger	43	65	48	1	1	0	12
Coyote	2,627	3,326	3,325	12	22	20	100
Mink	1,487	1,129	1,525	1	0	0	20
Raccoon	103,550	102,448	116,215	74	79	73	500
Red fox	1,434	1,173	1,113	12	3	3	50
Gray fox	776	879	1,004	0	0	0	20
River otter	2,253	2,758	2,981	0	3	0	150
Striped skunk	361	334	487	15	24	17	100
Virginia opossum	8,059	9,179	13,810	32	32	42	200

[1] Numbers for all species except river otters and bobcats may be underestimates of total sport take because not all pelts are taken to fur buyers. MDC requires registration of all river otter and bobcat pelts.

Woodchucks

The MDC is responsible for the management of the states woodchuck population. At this time MDC does not conduct population census for woodchucks. There is a set season for hunting woodchucks but no limit on the number of animals that may be taken. During CYs 2003-2005, WS lethally took from 1-4 woodchucks per year. Woodchucks have one litter a year that ranges from 2-6 young. Woodchucks breed at age 1 and live 4-5 years. If a pair of woodchucks and their offspring all survived to breed as soon as possible, with an average litter size of 4 with a 1:1 sex ratio; they could produce over 645 woodchucks through their life time. WS does not anticipate taking more than 100 woodchucks per year. Given the productivity of the species and the limited and localized nature of WS' actions, WS lethal removal of woodchucks for MDM will not adversely impact woodchuck populations.

Rabbits

There are 9 species of cottontail rabbits in North America, north of Mexico. The eastern cottontail (*Sylvilagus floridanus*) is the most abundant and widespread of all these. The majority of problems with rabbits in Missouri are associated with cottontail rabbits.

Population densities for cottontail rabbits vary with habitat quality, but 1 rabbit per 0.4 hectares (1 acre) is a reasonable average (Craven 1994). Rabbits live only 12-15 months, but they can raise as many as 6 litters per year of 1-9 young (usually 4-6; National Audubon Society 2000). No population estimates were available for cotton-tailed rabbits in Missouri. Cottontails are a regulated game species in Missouri and the MDC has established seasons and limits for this species. No figures are available regarding the total number of cottontail rabbits killed in Missouri each year.

WS estimates that no more than 1,000 cottontail rabbits may be taken per year for MDM. Almost all of these would be removed from urban, airport, commercial, or industrial habitats where hunting is not likely to occur. Cottontail rabbit damage management activities would target single rabbits or local populations of the species at sites where their presence was causing unacceptable damage to agriculture, human health or safety, natural resources, or property. Given the high productivity of cottontail rabbits and that WS actions will be confined to very small, scattered portions of the state that are usually not subjected to hunting, WS' limited lethal take of cottontail rabbits would have no adverse impacts on overall rabbit populations in the state.

Tree Squirrels

Fox squirrels *(Sciurus niger)* and eastern gray squirrels *(Sciurus carolinensis)* are the primary species involved in squirrel damage complaints. For that reason only those two species will be treated in this section. Further reference to "squirrels" as a group in this section will be construed to mean these two species.

Gray and fox squirrels are found throughout most of the eastern U. S., including Missouri. They inhabit mixed hardwood forests, especially those containing nut trees such as oak/hickory mix. The MDC estimates the total (combined) population of these two species in the state at approximately 15 million individuals (L. Hansen, MDC, pers. comm.). Gray and fox squirrels are considered small game by the MDC which has established seasons and bag limits for squirrel hunting. Information regarding the total number of squirrels killed in Missouri annually is not available. Gray squirrels produce young during early spring, while fox squirrels have litters around February to early March, but may actually produce at any time until early September (National Audubon Society 2000). Older adults of both species may produce two litters per year (Burt and Grossenheider 1964, Jackson, 1994*b*). The gestation period is 42-45 days, and about three young comprise a litter. Young begin to explore outside the nest at about 10-12 weeks of age (Jackson 1994*b*). Squirrel populations periodically rise and fall, and during periods of high populations they may go on mass emigrations, during which time many animals die. These species are vulnerable to numerous parasites and diseases such as ticks, mange mites, fleas, and internal parasites. Squirrels are also prey for hawks, owls, snakes, and several mammalian predators. Predation seems to have little effect on squirrel populations. Typically about half the squirrels in a population die each year and wild squirrels over 4 years old are rare, while captive individuals may live 10 years or more (Jackson 1994*b*).

Based upon an anticipated increase for requests for WS assistance, WS anticipates killing no more than 100 squirrels per species per year for MDM in Missouri. This number is insignificant relative to the total estimate populations of these species. These squirrels would almost always be removed from urban and suburban populations which are not hunted. Some local populations may be temporarily reduced as a result of MDM projects aimed at reducing damage at a local project site. Given the low number of squirrels that could be taken relative to the number likely taken by licensed hunters (possession limit = 12) and the limited amount of area in the state where WS would conduct squirrel damage management activities, WS' lethal take of squirrels would not adversely impact gray or fox squirrel populations in Missouri.

Small Rodents and Insectivores

Native Species: Small rodents (pocket gophers, ground squirrels, mice, voles) and insectivores (shrews and moles) are taken by WS during wildlife hazard management, assessment, and monitoring at airports and airbases, since these species serve as attractants to birds such as vultures and hawks and mammalian predators, which create direct hazards to public safety and aviation (USDA 2002). Additionally, these species may be taken in orchards and other cultivated areas to reduce damage to property, vegetation in parks and near residences, and agricultural resources,

such as apple trees and alfalfa crops. These species may also be taken to reduce risks to human health and safety.

The primary small rodent and insectivore species that are likely to be taken during MDM efforts in Missouri are thirteen lined ground squirrels, plains pocket gophers, prairie voles (*Microtus ochrogastor*), deer mice (*Permomyscus maniculatus*), white-footed mice (*Peromyscus leucopus*), Eastern mole, and short-tailed shrews (*Blarina brevicauda*).White-footed mice, deer mice, prairie voles and short-tailed shrews are very prolific: white-footed mouse (2-4 litters per year, 5 young each), deer mouse (3-4 liters, 4-6 young each), prairie vole (3-4 litters, 3-4 young each) short-tailed shrew (2-3 litters per year, 5-8 young each) (Godin 1977, Burt and Grossenheider 1976). Eastern moles, plains pocket gophers, and thirteen-lined ground squirrels have 1-2 liters per year: Eastern mole (2-5 young each), plains pocket gopher (1 liter per year in the North, two or more per year in the South, 3-5 young each), thirteen-lined ground squirrels (usually 1 litter per year, 7-10 young), (Godin 1977, Burt and Grossenheider 1976). Large population fluctuations are characteristic of many small rodent populations. Determination of numbers of rodents killed by MDM actions is difficult when lethal chemical methods such as zinc phosphide treatments are employed. This is because most animals killed by these methods die underground.

Removal of these species by WS would be done at specific isolated sites (e.g., airports, orchards, etc.). Impacts of these activities to rodent and insectivore populations would be minimal due to the species' relatively high reproductive rates and because rodent/insectivore damage management recommended and conducted by WS would be at a limited number of specific local sites, via legal methods, and pursuant to permits. Based upon the above information, WS limited lethal take of small rodents would have no adverse impacts on overall populations of the species in Missouri.

Non-native Species: Norway Rats, black (roof) rats and house mice are not native to North America and were accidentally released into this country. In the wild, the impact of these species is generally perceived as entirely detrimental to native ecosystems (Burt and Grossenheider 1976). These species eat anything edible and may prey on eggs or offspring of native species and compete with native species for resources. Executive Order 13112 – Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. Although removal of these species up to and including extirpation could be seen as desirable, for reasons described above for native rodents and insectivores, WS is unlikely to ever have this level of impact on overall populations of these species in Missouri.

Feral Swine

Feral swine are a non-native species, and are primarily found in the southern portions of the state. The MDC currently considers feral swine as an invasive species and does not track harvest or population densities of feral swine. However biologists with WS and the MDC are reporting an increase in reports of feral swine sightings and activity, and are concerned that feral swine numbers in Missouri are increasing and expanding their range. WS could be requested to assist with the removal of feral swine either for the reduction of damage cause by feral swine to agricultural and natural resources, for reduction of risks to human health and safety, reduction of risks of disease transmission to domestic swine, and/or for disease surveillance and management. Based upon current and anticipated increases in requests for feral swine management, it is anticipated that not more than 1,000 feral swine would be killed annually. Feral swine often have negative impacts on the environment, are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Any reduction in feral swine populations could be considered a beneficial impact to the environment (Section 1.2.4). Executive Order 13112 – Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. The MDC has established a

management goal of total eradication for feral swine and places no limits on the take of feral swine.

Feral Cats

Feral cats (*Felis catus*) are house cats living in the wild. Cats are found in commensal relationships wherever people are found. In some urban and suburban areas, cat populations equal human populations. Feral cats produce 2 - 10 kittens during any month of the year. An adult female may produce 3 litters per year where food and habitat are sufficient. Cats are opportunistic predators and scavengers that feed on rodents, rabbits, shrews, moles, birds, insects, reptiles, amphibians, fish, carrion, garbage, vegetation, and leftover pet food (Fitzwater 1994). Where it has been documented, the impact of feral cats on wildlife populations in suburban and rural areas, directly by predation, and indirectly by competition for food, has been enormous (Coleman and Temple 1989). In the United Kingdom, one study determined that house cats may take an annual toll of some 70 million animals and birds (Churcher and Lawton 1987). In addition, feral cats serve as a reservoir for human and wildlife diseases, including cat scratch fever, distemper, histoplasmosis, leptospirosis, mumps, plague, rabies, ringworm, salmonellosis, toxoplasmosis, tularemia, and various parasites (Fitzwater 1994).

WS has provided technical and operational assistance with feral cat problems in Missouri. WS has assisted with the removal of feral cats from a popular recreational fishing area where an overabundance of feral cats was causing concerns about risks to human health. Feral cats have also created problems at a major metropolitan zoo and on various airfields throughout the state.

When conducting feral cat management projects, WS will give preference to live capture methods. Live-captured cats will be given to local animal shelters and/or animal control offices. Every effort will be made to avoid using lethal control on cats bearing obvious identification (e.g., collars). Although preference will be given to live-capture methods, based on current and anticipated requests for assistance with feral cat management, WS estimates that up to 150 feral cats may be lethally removed by WS per year. Many of these would be removed in projects aimed at protecting human health and safety, valuable wildlife, or captive birds and other animals. This number is insignificant to the total population of this species in the State. In metropolitan areas of Missouri, animal control officers capture and remove hundreds of feral cats each year (Spay and Neuter Kansas City 2006). Nationwide, the Humane Society of the United States estimates that between 3 and 4 million cats are euthanized in shelters each year. Any MDM involving lethal control actions by WS would be restricted to isolated individual sites. Some local populations may be temporarily reduced as a result of MDM projects aimed at reducing damage at a local site. In those cases where feral cats are causing damage or are a nuisance and complete removal of the local population could be achieved, this would be considered a beneficial impact on the human environment since these species are not considered part of the native ecosystem. However, given the reproductive capacity of feral cats and the limited and localized nature of WS' proposed actions, WS' limited lethal removal of feral cats is unlikely to reduce overall populations of this species in Missouri.

Feral Dogs

Most feral dogs today are descendants of domestic dogs gone wild, and they often appear similar to dog breeds that are locally common (Green and Gipson 1994). The primary feature that distinguishes feral from domestic dogs is the degree of reliance or dependence on humans, and in some respect, their behavior toward people. Feral dogs survive and reproduce independently of human intervention or assistance. While it is true that some feral dogs use human garbage for food, others acquire their primary subsistence by hunting and scavenging like other wild canids. Feral dogs are usually secretive and wary of people. They often travel in packs or groups and may have rendezvous sites like wolves. Feral dogs are opportunistic feeders. They can be efficient predators, preying on small and large animals, including domestic livestock. Many rely on

carrion, particularly road-killed animals, crippled waterfowl, green vegetation, berries and other fruits, and refuse at garbage dumps (Green and Gipson 1994).

Feral dogs can cause damage by killing or injuring livestock, poultry, house cats, or domestic dogs. They may also feed on fruit crops including melons, berries, grapes, and native fruit. They may also attack people, especially children. This is especially true where they feed at and live around, garbage dumps near human dwellings (Green and Gipson 1994). In some locales, they may present a serious threat to deer (Lowry 1978) and other valuable wildlife (Green and Gipson 1994). Feral dogs may also pose threats to air traffic by invading airport environments to forage (K. Stucker, R. Myers, S. Stopak, USDA-WS, pers. comm., 2003).

During the period of 2003-2005, WS killed only 1 feral dog for MDM in Missouri. Any MDM involving lethal control actions by WS would be restricted to isolated individual sites. As with feral cats, preference will be given to the use of live-capture methods. Live-captured dogs will be given to local animal shelters, animal control offices, or their equivalents. Every effort will be made to avoid using lethal control on dogs bearing obvious identification (e.g., collars). Although preference will be given to live-capture methods, based on current and anticipated requests for assistance with feral dog management, it is possible that WS could kill as many as 100 feral dogs each year for MDM programs in the state. Most of these would be removed in projects aimed at protecting human health and safety, valuable wildlife or other natural resources, livestock, or other agriculture. Some local populations may be temporarily reduced as a result of MDM projects. In those cases where feral dogs are causing damage or are a nuisance and complete removal of the local population could be achieved, this would be considered a beneficial impact on the human environment since these species are not considered part of the native ecosystem. However, given the limited and localized nature of WS' proposed actions, WS' limited lethal removal of feral dogs is unlikely to reduce overall populations of this species in Missouri.

Nine-banded Armadillos

The nine banded armadillo (*Dasypus novemcinctus*) is easily recognized due to its unique appearance. Female armadillos produce one litter of young per year, which are identical quadruplets. Armadillos occupy a variety of habitats, including moist forests, pastures, and brushy or scrub lands (Whitaker, Jr. and Hamilton, Jr., 1998). Armadillos dig burrows for shelter. Armadillos do not hibernate, and cannot survive prolonged periods of below freezing weather (National Audubon Society 2000). Population densities for armadillos are reported to be from 0.05 to 3 per ha (0.02 – 1.2 per acre). The life expectancy of an armadillo in the wild is rarely more than two years (Whitaker, Jr. and Hamilton, Jr., 1998).

Armadillo damage occurs from their rooting in lawns, golf courses, vegetable gardens, and flower beds. Entire plants may be uprooted and die. Burrowing under driveways, foundations and other structures is also damaging. It is likely that WS will be involved in armadillo control work in the near future.

Wildlife Services killed no armadillos in Missouri during FY 2003-2005. In future programs, it is possible that WS could kill 100 armadillos per year in all MDM programs in the state. No population estimates were available for nine banded armadillos in Missouri. The armadillo distribution in Missouri includes most of the lower half of the state with scattered pockets in the northern portions of the state (Taulman and Robbins 1996). Observations by MDC and WS staff indicate that armadillo populations are increasing in the areas of the state with suitable armadillo habitat. WS limited lethal take of armadillos would have no adverse impacts on overall populations of the species in Missouri.

Other Target Species

Target species, in addition to those analyzed above, have been killed in small numbers by WS during the past year and have included no more than 20 individuals of a given species (Table 4-1). Other species that could be killed during MDM may include but are not necessarily limited to the species listed in Section 1.2. None of these species are expected to be taken by WS MDM at any level that would adversely affect populations. WS would not conduct MDM involving state-listed threatened or endangered or sensitive species without situation specific consultation with MDC. Given MDC oversight (state protected species), and WS limited lethal take, none of the above mentioned mammal species are expected to be taken by WS MDM at any level that would adversely affect overall mammal populations on a local or statewide basis.

4.1.1.3 Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not take any target mammal species because no lethal methods would be used. Although WS lethal take of mammals would not occur, as with Alternative 1, it is likely that without WS conducting some level of lethal MDM activities for these species, private MDM efforts would increase. Cumulative impacts on target species populations would be variable depending upon actions taken by affected landowners/resource managers and the level training and experience of the individuals conducting the MDM. Some individuals experiencing damage may take illegal or unsafe action against the problem species either unintentionally due to lack of training, or deliberately out of frustration of continued damage. In these instances, more target species may be taken than with a professional WDM program (Alternatives 2). Ready access to WS assistance with non-lethal MDM may decrease private efforts to use lethal techniques. Therefore, take of target species may be less than anticipated with Alternatives 1 and 4. Overall impacts on target species populations would be similar to or slightly higher than Alternative 2 depending upon the extent to which resource managers use the assistance provide by WS. However, for the reasons presented in the population effects analysis in section 4.1.1.2, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

4.1.1.4 Alternative 4: No Federal WS Mammal Damage Management

Under this alternative, WS would have no impact on target mammal populations in the State. Private efforts to reduce or prevent depredations would likely increase. As with Alternatives 1 and 3, cumulative impacts on target species populations would be variable. Impacts would depend upon actions taken by affected landowners/resource managers and the level training and experience of the individuals conducting MDM. Impacts on target species are likely to be similar to or slightly higher than Alternative 2. Because resource owners/managers would not have access to WS technical or operational assistance, impacts may be greater than alternatives 1 and 3. For the same reasons shown in the population effects analysis in section 4.1.1.2, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

4.1.2 Effects on Non-target Wildlife Species, including Threatened and Endangered Species

4.1.2.1 Alternative 1: Technical Assistance Only

Alternative 1 would not allow any WS direct operational MDM in Missouri; therefore WS would not take any non-target species under this alternative. The MDC or other natural resource management entities may have to allocate staff time and resources for projects to protect threatened, endangered and rare birds because WS could no longer assist with these programs. Only technical assistance or self-help information would be provided.

Although technical support might lead to more selective use of control methods by private parties than that which might occur under Alternative 4, private efforts to reduce or prevent depredations could still result in less experienced persons implementing control methods, leading to greater risks to non-target wildlife than under the proposed action. It is hypothetically possible that, similar to Alternative 3 and 4, frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown risks to non-target species populations. Hazards to predators and scavengers, including pets, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

Effects on T&E species – WS will not have any direct impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the bald eagle. Risks to T&E species may be lower with this Alternative than with Alternative 4 because WS could advise individuals as to the potential presence of State and Federally listed species in their area and could facilitate consultation with the appropriate agency.

4.1.2.2 Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Effects on Non-target (non-T&E) Species. Direct impacts on non-target species could occur if WS program personnel were to inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. Non-target species are usually not affected by non-lethal management methods, except for the occasional scaring from harassment devices. In these cases, affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action.

WS personnel are experienced and trained in wildlife identification, and to select the most appropriate methods for taking targeted animals and excluding non-target species. Shooting is virtually 100% selective for the target species; therefore no adverse impacts are anticipated from use of this method. One potential source of injury or death of non-target species is the use of capture devices. WS personnel use animal lures and set traps and snares in locations that are conducive to capturing target animals while minimizing potential impacts to non-target species. Any non-target species captured would be subsequently released on site unless it is determined by the WS Specialist that the animal will not survive. Risks to non-target species from WS use of these methods for mammal damage management proposed in this EA has been extremely low (Table 4-3). WS take of non-target species in capture devices is expected to continue to be very low. If take of non-target species would occur, these occurrences are rare and should not affect the overall populations of any species.

Table 4-3. Non-target animals taken during WS mammal damage management activities.

Species	2003		2004		2005	
	Killed	Released	Killed	Released	Killed	Released
Gray squirrel	0	7	0	0	0	0
Cottontail rabbit	0	1	0	1	0	3
Mourning dove	0	0	0	1	0	0

Use of pesticides (e.g., rodenticides) is another potential source of non-target species impacts. WS' SOPs would require compliance with pesticide label directions and use restrictions, and

establish training requirements for all employees applying pesticides as built-in measures to assure that use of registered chemical products does not result in significant adverse effects on non-target species populations. Risk Assessments conducted on the WS program concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997 Revised). Chemical pesticides that have come into use since the Risk Assessment was completed have undergone considerable environmental review through EPA and State registration processes, which means they have been found to present no unreasonable risk to the environment or human health and safety when used according to label directions. Standard operating procedures designed and implemented to avoid adverse effects on non-target species are described in Chapter 3.

Effects on T&E species - WS MDM activities in Missouri would not adversely affect any Federal or State listed T&E species population. This determination is based, in part, on the conclusions made by the FWS during their 1992 programmatic consultation on the National WS program and subsequent Biological Opinion (USDA 1997 Revised) and an informal Section 7 consultation with the USFWS regarding the risks to Federally listed T&E species from the actions proposed in this EA (Appendix C). Missouri WS will adhere to all applicable Reasonable and Prudent Measures and Terms and Conditions from the 1992 Biological Opinion and recommendations from the USFWS specific to this action. WS also consult with the MDC and USFWS regarding any specific risks to State-listed dnon-target species in Missouri from MDM by WS (Appendix D).

4.1.2.3 Alternative 3: Non-lethal Mammal Damage Management Only by WS

WS efforts to protect rare, threatened or endangered species would not be as effective as the preferred alternative because WS would be unable to access lethal techniques if non-lethal techniques are ineffective. Lethal efforts to protect these species would have to be conducted by other natural resource management entities (e.g. MDC).

Under this alternative, WS take of non-target animals would be less than that of the proposed action because no lethal control actions would be taken by WS. Non-target species are usually not affected by WS' non-lethal management methods, except for the occasional scaring from harassment devices. In these cases, affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action. Capture and release (e.g., for disease monitoring) and capture and relocate would be allowed under this alternative. There is the extremely remote chance that the capture devices could result in the death of a non-target animal. However, given that these devices would be applied with provisions to keep the target animal alive, the risks to non-target species are very low and would not result in adverse impacts on non-target species populations.

If mammal damage problems were not effectively resolved by non-lethal control methods, members of the public may resort to other means of lethal control such as the use of shooting or the use of pesticides. This could result in less experienced persons implementing control methods and could lead to greater risks to non-target wildlife than the proposed action. For example, shooting by persons not proficient at mammal identification could lead to killing of non-target mammals. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects on local non-target species populations. Hazards to predators and scavengers including pets could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

Effects on T&E species – As discussed for Alternative 2, most WDM methods will not have any direct impact on T&E species. Capture and release (e.g., for disease monitoring) and capture and relocate would be allowed under this alternative. The same provisions to reduce risks to T&E

species from wildlife capture methods discussed in Alternative 2 would be used for this Alternative. Therefore, risks to T&E species would be lower under this alternative than for Alternative 2.

Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the bald eagle. Risks to T&E species may be lower with this Alternative than with Alternative 4 because people would have ready access to assistance with non-lethal MDM techniques. WS could advise individuals as to the potential presence of state and federally listed species in their area.

4.1.2.4 Alternative 4: No Federal WS Mammal Damage Management

Alternative 4 would not allow any WS MDM in the State; therefore WS would not take any non-target species under this alternative. The MDC or other natural resource management entities may have to allocate staff time and resources for projects to protect threatened, endangered and rare birds because WS could no longer assist with these programs.

Private efforts to reduce or prevent depredations would likely increase which could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than under the proposed action. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could impact local non-target species populations. Hazards to predators and scavengers, including pets, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

Effects on T&E species – WS will not have any direct impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the bald eagle. Risks to T&E species may be higher with this Alternative than with the other alternatives because WS would not have any opportunity to provide technical assistance on the safe and effective use of MDM techniques or have the opportunity to advise individuals regarding the presence of T&E species.

4.1.3 Effects on Human Health and Safety

4.1.3.1 Safety and Efficacy of Chemical Control Methods

Alternative 1: Technical Assistance Only

Alternative 1 would not allow any direct operational MDM assistance by WS. Concerns about human health risks from WS' use of chemical MDM methods would be alleviated because no such use would occur. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and leading to a greater risk than Alternative 2. However, because some of these private parties would be receiving advice and instruction from WS, concerns about human health risks from chemical MDM methods use should be less than under Alternative 4.

Hazards to humans could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the Proposed Action alternative.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Toxicants. The toxicants that could be used by WS under this alternative are described in detail in Appendix B and include zinc phosphide (ZnP), gas cartridges, strychnine, and anticoagulant rodenticides. WS personnel who use toxicants are certified pesticide applicators who use, store and dispose of these products in accordance with label restrictions and guidelines. Based on a thorough Risk Assessment, APHIS concluded that, when WS Program chemical methods, including those referenced above, are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997 Revised). Chemical pesticides that have come into use since the Risk Assessment was completed have undergone considerable environmental review through EPA and State registration processes, which means they have been found to present no unreasonable risk to the environment or human health and safety when used according to label directions. Therefore, use of these products by the Missouri WS program is not expected to adversely affect public safety.

Other MDM Chemicals. Non-lethal MDM chemicals that might be used or recommended by WS would include repellents such Hinder, Deer Away and others that are registered with the MDA and Federal EPA. Such chemicals must undergo rigorous testing and research to prove safety, and low environmental risks before they would be registered by the EPA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and State pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following label requirements and use restrictions is a built-in SOP that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Drugs used in capturing, sedating, handling, and euthanizing wildlife for wildlife management purposes include ketamine hydrochloride, a mixture of tiletamine and zolazepam (Telazol), xylazine (Rompun), sodium pentabarbitol, potassium chloride, Yohimbine, antibiotics, and others. WS would adhere to all applicable requirements of the Animal Medicinal Drug Use Clarification Act (AMDUCA) to prevent any significant adverse impacts on human health with regard to this issue. Standard operating procedures for the use of drugs would include:

- All drugs used in capturing and handling wildlife would be under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and WS. As determined on a state-level basis by these veterinary authorities, wildlife hazard management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Animals that have been drugged and released would be ear tagged or otherwise marked to alert hunters and trappers that they should contact state officials before consuming the animal.

- Most drug administration would be scheduled to occur well before state controlled hunting/trapping seasons which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by humans. In some instances, animals collected for control purposes would be euthanized when they are captured within a certain specified time period prior to the legal hunting or trapping season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems.

- Activities involving the handling and administering drugs, drugs selected for use, animal marking systems, and the fate of any animals that must receive drugs at times during or close to scheduled hunting seasons would be coordinated with the MDC.

By following these procedures, the proposed action would avoid any significant impacts on human health with regard to this issue.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Alternative 3 would not allow for any lethal mammal damage management by WS in Missouri. WS could only implement non-lethal methods such as harassment and exclusion devices and materials. Non-lethal methods could, however, include use and recommendation of repellents and could use the use of capture and handling drugs for capture and release projects. Impacts from WS use of these chemicals would be similar to those described under the proposed action.

Excessive cost or ineffectiveness of non-lethal techniques could result in some entities rejecting WS' assistance and resorting to other means of MDM. Risks associated with non-WS use of toxicants will vary depending upon the training and experience of the individuals conducting the MDM. Such means could include illegal pesticide uses. Hazards to humans could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the proposed alternative. Overall risks to human health and safety from this alternative are likely to be equal to or greater than Alternative 2.

Alternative 4: No Federal WS Mammal Damage Management

Alternative 4 would not allow any WS MDM in Missouri. Concerns about human health risks from WS' use of chemical MDM methods would be alleviated because no such use would occur. Private efforts to reduce or prevent damage would be expected to increase. Risks to human health and safety from chemical MDM methods will be variable depending upon the training and experience of the individual conducting the MDM. Hazards to humans could be greater under this alternative if other chemicals that are less selective or that cause secondary poisoning are used or if chemicals are used improperly by inexperienced personnel. It is hypothetically possible that frustration caused by the inability to alleviate mammal damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the current program alternative.

4.1.3.2 Impacts on Human Safety of Non-chemical MDM Methods

Alternative 1: Technical Assistance Only

Under this alternative, WS would not engage in direct operational use of any non-chemical MDM methods. Risks to human safety from WS' use of firearms, traps, snares and pyrotechnics would not exist because WS would not be conducting direct control activities. However, WS would provide technical advice to those persons requesting assistance. Landowners/resource managers could use information provided by WS or implement damage reduction methods without WS technical assistance. Hazards to humans and property could be greater under this alternative if personnel conducting MDM activities using non-chemical methods are poorly or improperly trained. Negative impacts to public safety resulting from the improper use of control methods should be less than Alternative 4 when WS technical advice is followed.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Non-chemical MDM methods that might raise safety concerns include shooting with firearms, use of traps and snares, and harassment with pyrotechnics. All WS personnel are trained in the safe and effective use of MDM techniques. The Missouri WS program has had no accidents involving the use of any of its non-chemical MDM techniques including firearms, pyrotechnics, traps, or snares in which any person was harmed. A formal risk assessment of WS' operational management methods found that when used in accordance with all applicable, laws, regulations, policy and directives, risks to human safety from the proposed methods were low (USDA 1997 Revised, Appendix P). Therefore, no adverse affects on human safety from WS' use of these methods is expected. Standard operating procedures designed and implemented to avoid adverse effects on public and pet health and safety are described in Chapter 3. Therefore, no adverse affects on human safety from WS' use of these methods is expected.

Shooting and trapping are methods used by WS which pose minimal or no threat to public health and safety. All firearm safety precautions are followed by WS when conducting MDM and WS complies with all laws and regulations governing the use of firearms. Shooting is virtually 100% selective for target species and may be used in conjunction with spotlights. WS may use firearms to humanely euthanize animals caught in live traps. WS traps are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where traps are set to alert the public of trap presence.

Firearms and firearm misuse are a cause of concern because of issues relating to public safety and accidental injury or death. To ensure safe use of firearms, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment must comply with all applicable Federal State and local regulations including the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, non-chemical MDM methods that might raise safety concerns include shooting with firearms when used as a harassment technique, cage traps, and harassment with pyrotechnics. Risks associated with firearms used as a harassment technique are as discussed for firearms use in Alternative 2. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. A formal risk assessment of WS operational management methods including the non-lethal techniques that would be available under this alternative, found that risks to human safety were low (USDA 1997 Revised, Appendix P). Therefore, no adverse affects on human safety from WS' use of these methods is expected.

Some resource owners/managers may not feel that non-lethal techniques are adequate to resolve their wildlife conflict and may use lethal MDM methods without WS assistance. Risks to human safety from these actions will depend on the method selected and the experience and training of the individual using the technique.

Alternative 4: No Federal WS Mammal Damage Management

Alternative 4 would not allow any WS MDM in the State. Concerns about human health risks from WS' use of non-chemical MDM methods would be alleviated because no such use would occur. However, private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the proposed action alternative. Non-WS

personnel would be able to use pyrotechnics, traps, snares or firearms in MDM programs and this activity would likely occur to a greater extent in the absence of WS assistance. Hazards to humans and property could be greater under this alternative if personnel conducting MDM activities using non-chemical methods are poorly or improperly trained.

4.1.3.3 Effects on Human Health and Safety from Mammals

Alternative 1: Technical Assistance Only

With WS technical assistance but no direct management, entities requesting MDM assistance for human health concerns would either take no action, which means the risk of human health problems would likely continue or increase in each situation as mammal numbers are maintained or increased, or implement their own MDM program with or without technical assistance from WS. Potential impacts would be variable depending upon the training and experience of the individuals conducting the MDM. Individuals or entities that implement may lack the experience necessary to efficiently and effectively conduct an effective MDM program and risks could continue or increase. Therefore, the odds of successfully reducing wildlife risks to human health and safety may be similar to or lower than Alternative 2. The likelihood that individual efforts would reduce mammal conflicts would be higher under this alternative than Alternative 4 if people request and use WS technical assistance recommendations.

In some situations the implementation of some MDM methods can actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected. These problems may be minimized if WS is providing technical assistance and helping to coordinate MDM activities with local authorities to assure they do not reestablish in other undesirable locations.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

An Integrated MDM strategy, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing human health and safety risks associated with the mammals addressed in this EA. Under this alternative, all legal MDM methods would be available to and could be recommended by WS. Efficacy of any given MDM method will vary depending on site specific conditions. Access to the full range of MDM methods results in the greatest possibility of alleviating risks to human health and safety by allowing WS specialists to pick the methods best suited to the particular situation.

In most cases, it is difficult to conclusively prove that mammals were responsible for transmission of individual human cases or outbreaks of mammal-borne diseases. However, the limited records of disease occurrence in Missouri does not necessarily mean absence of risk, but may only mean lack of reliable research in this area. There are limited studies are available on the occurrence and transmission of zoonotic diseases in wild mammals. Study of this issue is complicated by the fact that some disease-causing agents associated with wildlife, may also be contracted from other sources. WS works with cooperators on a case-by-case basis to assess the nature and magnitude the wildlife conflict including providing information on the limitations about what we know regarding health risks associated with wild mammals. In most cases, the risk of contracting a disease from wild mammals is relatively low. It is the choice of the individual cooperator to tolerate the potential health risks or to seek to reduce those risks. Certain requesters of MDM assistance may consider even a low level of risk to be unacceptable. Many property owners/managers wish to eliminate risks *before* some one actually gets sick because of conditions at their site. In such cases, MDM, either by lethal or non-lethal means, would, if successful, reduce the risk of mammal-borne disease transmission at the site for which MDM is requested.

In some situations the implementation of non-lethal controls such as netting barriers and harassment could actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected. In such cases, lethal removal of the mammals may actually be the best alternative from the standpoint of overall human health concerns in the local area. If WS is providing direct operational assistance in relocating mammals, coordination with local authorities would be conducted to assure they do not reestablish in other undesirable locations.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with mammal damage problems. Non-lethal methods may not be effective at or suitable for all situations. The efficacy of some techniques may be limited by habituation (the ability of an animal to become accustomed to and not respond to an otherwise frightening sight or sound). Other techniques like fencing may not be suitable because of zoning, visual impacts on the site, or because they may adversely impact other non-injurious species. In some situations the implementation of non-lethal controls such as netting barriers and harassment could actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected. However, when WS is providing direct operational assistance in relocating mammals, coordination with local authorities would be conducted to minimize the risk of problem animals relocating to other undesirable areas.

Alternative 4: No Federal WS Mammal Damage Management

With no WS assistance, cooperators would be responsible for developing and implementing their own MDM program. Success of cooperator efforts to reduce or prevent risks to human health and safety from wildlife will depend on the training and experience of the individual conducting the MDM. If less experienced persons attempt to implement control methods, risks of not reducing mammal hazards could be greater than under the proposed action. For example, in some situations the implementation of non-lethal controls such as netting barriers and harassment could actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected.

4.1.4 Impacts to Stakeholders, including Aesthetics

4.1.4.1 Effects on Human Affectionate Bonds with Individual Mammals and on Aesthetic Values of Wild Mammal Species

Alternative 1: Technical Assistance Only

Under this alternative, WS would not conduct any direct operational MDM, but would still provide technical assistance or self-help advice to persons requesting assistance with mammal damage. Those who oppose direct operational assistance in wildlife damage management by the government, but favor government technical assistance, would favor this alternative. Persons who have developed affectionate bonds with individual wild mammals would not be affected by WS' activities under this alternative because this individual animal would not be killed by WS. However, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the cumulative affects would then be similar to the Proposed Action alternative.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Those who routinely view or feed individual animals would likely be disturbed by removal of such mammals under the current program. WS is aware of such concerns and takes these concerns into

consideration when developing site specific management plans. In some instances, WS may be able to mitigate such concerns by leaving certain animals that have been identified by interested individuals.

Some members of the public have expressed opposition to the killing of any mammals during MDM activities. Under this Proposed Action alternative, some lethal control of mammals would occur and these persons would be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular mammals that would be killed by WS' lethal control activities. Lethal control actions would generally be restricted to local sites and to small, unsubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would, therefore, continue to remain available for viewing by persons with that interest.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not conduct any lethal MDM, but may conduct harassment of mammals that are causing damage. Some people who oppose lethal control of wildlife by the government, but are tolerant of government involvement in non-lethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild mammals would not be affected by the death of individual mammals under this alternative, but might oppose dispersal or translocation of certain mammals. WS may be able to mitigate such concerns by leaving certain animals that have been identified by interested individuals. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the proposed action alternative.

Alternative 4: No Federal WS Mammal Damage Management

Under this alternative, WS would not conduct any lethal removal of mammals nor would the program conduct any harassment of mammals. Those in opposition of any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild mammals would not be affected by WS' activities under this alternative. However, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the proposed action alternative.

4.1.4.2 Effects on Aesthetic Values of Property Damaged by Mammals

Alternative 1: Technical Assistance Only

Wildlife Services would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. When WS technical advice is requested and followed, impacts on those persons adversely affected by mammal damage should be less than Alternative 4. However, some resource owners' efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could be take longer to execute and may be less effective under this alternative than the proposed action alternative depending upon the skills and abilities of the person implementing MDM control methods.

Relocation of mammals through harassment, barriers, or habitat alteration can sometimes result in the mammals causing the same problems at the new location. If WS has only provided technical assistance to local residents or municipal authorities, coordination with local authorities to monitor the mammal's movements to assure the mammals do not reestablish in other undesirable locations

might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Damage to property would be expected to decrease under this alternative since all available damage management methods and strategies would be available for WS use and consideration.

Relocation or dispersal of mammals by harassment can sometimes result in the mammals causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such mammals, coordination with local authorities would be conducted to assure they do not re-establish in other undesirable locations.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with mammal damage problems. While this may improve the use of non-lethal methods over that which might be expected under Alternative 4, the efficacy of non-lethal methods can be quite variable. If non-lethal methods were ineffective at reducing damage, WS would not be able to provide any other type of assistance. In these situations, mammal damage would likely continue to increase unless resource owners implemented an effective MDM program in the absence of WS. Resource owners' efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could be take longer to execute and may be less effective under this alternative than the proposed action alternative depending upon the skills and abilities of the person implementing MDM control methods.

Assuming property owners would choose to allow and pay for the implementation of non-lethal methods, this alternative could result in mammals relocating to other sites where they could cause or aggravate similar problems for other property owners. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the Proposed Action alternative.

Relocation or dispersal of mammals by harassment can sometimes result in the mammals causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such mammals, coordination with local authorities would be conducted to assure they do not re-establish in other undesirable locations.

Alternative 4: No Federal WS Mammal Damage Management

Mammal damage would likely continue to increase unless resource owners implemented an effective MDM program in the absence of WS. Resource owners could implement their own damage reduction program without WS assistance. Resource owners' efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could be take longer to execute and may be less effective under this alternative than the proposed action alternative depending upon the skills and abilities of the person implementing MDM control methods.

Relocation of mammals through harassment, barriers, or habitat alteration can sometimes result in the mammals causing the same problems at the new location. Coordination of relocation and dispersal activities by local residents with local authorities to monitor the mammal's movements to assure the mammals do not re-establish in other undesirable locations might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

4.1.5 Humaneness and Animal Welfare Concerns of Methods Used

4.1.5.1 Alternative 1: Technical Assistance Only

Under this alternative, WS would provide self-help advice only. Lethal methods viewed as inhumane by some persons would not be used by WS. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Many of the methods considered inhumane by some individuals and groups might still be used by resource owners. Overall impacts should be less than Alternative 4 when WS technical advice is requested and followed.

4.1.5.2 Alternative 2: Implement an Integrated Mammal Damage Management Program (Proposed Action/No Action)

MDM methods viewed by some persons as inhumane would be employed by WS under this alternative. These methods would include shooting, trapping, toxicants/chemicals, and snares. Despite SOPs and state trapping regulations designed to maximize humaneness, the perceived stress and trauma associated with being held in a trap or snare until the WS employee arrives at the capture site to dispatch or release the animal, is unacceptable to some persons. Other MDM methods used to take target animals including shooting and body-gripping traps (i.e., Conibear) result in a relatively humane death because the animals die instantly or within seconds to a few minutes. These methods however, are also considered inhumane by some individuals.

WS would use EPA registered and approved pesticides, such as zinc phosphide, strychnine, anticoagulant rodenticides and gas cartridges to manage damage caused by some mammals in Missouri. Some individuals consider the use of such chemicals to be inhumane. WS personnel are experienced, professional and humane in their use of management methods. Under this alternative, mammals would be killed by experienced WS personnel using the best and most appropriate method(s) available. Some people may perceive these methods as inhumane because they oppose all lethal methods of damage management.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some MDM methods are used in situations where non-lethal damage management methods are not practical or effective.

4.1.5.3 Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, lethal methods, viewed as inhumane by some persons, would not be used by WS. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, resulting in impacts similar to the proposed action alternative.

4.1.5.4 Alternative 4: No Federal WS Mammal Damage Management

Under this alternative, lethal methods, viewed as inhumane by some persons, would not be used by WS. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, resulting in impacts similar to the proposed action alternative.

4.2 CUMULATIVE IMPACTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Under Alternatives 1, 2 and 3, WS would, to varying extents, address damage associated with mammals in a number of situations throughout the State. The WS MDM program would be the primary Federal program with MDM responsibilities; however, some State and local government agencies may conduct MDM activities in Missouri as well. Through ongoing coordination with these agencies, WS is aware of such MDM activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct MDM activities at adjacent sites within the same time frame. In addition, commercial pest control companies may conduct MDM activities in the same area. The potential cumulative impacts analyzed below could occur either as a result of WS MDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Cumulative Impacts on Wildlife Populations

As shown in Section 4.1.1, MDM methods used or recommended by the WS program in Missouri will have no cumulative adverse effects on target and non-target wildlife populations. WS limited lethal take of target mammal species is anticipated to have minimal impacts on target mammal populations in Missouri. While the objective in feral hog control is total eradication, that is unlikely, and a more realistic result is to keep the population low enough to minimize damage. When control actions are implemented by WS the potential lethal take of non-target wildlife species is expected to be minimal and will not adversely affect populations of these species.

Cumulative Impact Potential from Chemical Components

MDM programs which include the use of pesticides as a lethal population management component may have the greatest potential for cumulative impacts on the environment as such impacts relate to deposit of chemical residues in the physical environment and environmental toxicosis. The toxicants ZnP, gas cartridges, strychnine and anticoagulant rodenticides are the chemicals most likely to be used or recommended by the Missouri WS MDM program. These chemicals have been evaluated for possible residual effects which might occur from buildup of the chemicals in soil, water, or other environmental sites in detailed risk assessments in the WS programmatic EIS (USDA 1997 Revised). Based on use patterns, the chemical and physical characteristics of mammal control toxicants, and factors related to the environmental fate of these pesticides, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS MDM program in Missouri (USDA 1997 Revised).

Non-lethal chemicals, such as repellents, may also be used or recommended by the WS MDM program in Missouri. Characteristics of these chemicals and use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS MDM programs in Missouri.

Cumulative Impact Potential from Non-chemical Components

Non-chemical methods used by WS MDM program may include exclusion through use of various barriers, live trapping and relocation or euthanasia of mammals, harassment of mammals, trapping, snaring, and shooting. Based on analysis in Sections 4.1.1 and 4.1.2, no cumulative impacts from WS use of these methods to take animals are expected especially given that take would be authorized and/or permitted with MDC oversight.

SUMMARY

No significant cumulative environmental impacts are expected from any of the 4 alternatives. Under the Proposed Action, the lethal removal of mammals by WS would not have significant impacts on overall target mammal populations in Missouri, but some short-term local reductions may occur. No risk to public safety is expected when WS' assistance is provided to and accepted by requesting individuals in Alternative 2 since only trained and experienced wildlife biologists/specialists would conduct and recommend MDM activities. There is a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1, 2 and 3 conduct their own MDM activities, and when no WS assistance is provided in Alternative 4. In all 4 Alternatives, however, the increase in risk would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS' participation in MDM activities on public and private lands in Missouri, the analysis in this EA indicates that WS Integrated MDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4-3 summarizes the expected impact of each of the alternatives on each of the issues.

Table 4-3. Summary of Potential Impacts.

Issue	Alternative 1 Technical Assistance Only	Alternative 2 Integrated Mammal Damage Management Program (Proposed Action/No Action)	Alternative 3 Non-lethal MDM Only by WS	Alternative 4 No Federal WS MDM Program
1. Target Mammal Species Effects	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.	Low effect - reductions in local target mammal numbers; would not significantly affect local or state populations	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.
2. Effects on Other Wildlife Species, Including T&E Species	No effect by WS. Impacts by non-WS personnel would be variable. WS would not provide operational assistance with T&E species protection	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS would provide operational assistance with T&E species protection	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS only able to provide limited operational assistance with T&E species protection.	No effect by WS. Impacts by non-WS personnel would be variable. WS would not provide operational assistance with T&E species protection
3. Human Health and Safety Effects	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.	The proposed action has the greatest potential of successfully reducing this risk. Low risk from methods used by WS.	Low risk of injuries from methods used by WS. WS less likely to resolve risks associated with animals than with Alt 2. Efforts by non-WS personnel to use lethal MDM techniques could result in less experienced persons implementing control methods, a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.
4a. Aesthetic Values of Wild Mammal Species and Human Affectionate Bonds Effects	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall state target mammal populations.	Low to moderate effect at local levels; Some local populations may be reduced; WS mammal damage management activities do not adversely affect overall state target mammal populations.	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase when non-lethal methods are ineffective unless non-WS personnel successfully implement lethal methods; no adverse affect on state target mammal populations.	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall state target mammal populations.

4b. Aesthetic Values of Property Damaged by Mammals	Mammal damage may not be reduced to acceptable levels; mammal may move to other sites which can create aesthetic damage problems at new sites.	Low effect - mammal damage problems most likely to be resolved without creating or moving problems elsewhere.	Mammal damage may not be reduced to acceptable levels; mammals may move to other sites which can create aesthetic damage problems at new sites.	High effect - mammal problems less likely to be resolved without WS involvement. Mammals may move to other sites which can create aesthetic damage problems at new sites
5. Humaneness and Animal Welfare Concerns of Methods Used	No effect by WS. Impacts by non-WS personnel would be variable.	Impact by WS low to moderate effect - methods viewed by some people as inhumane would be used by WS.	WS will have lower effects than Alt. 2 since only non-lethal methods would be used by WS. Impacts by non-WS personnel would be variable.	No effect by WS. Impacts by non-WS personnel would be variable.

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APPENDIX A: LITERATURE CITED

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APPENDIX B

MAMMAL DAMAGE MANAGEMENT METHODS

Resource owners and government agencies use a variety of techniques as part of integrated mammal damage management programs. All lethal and non-lethal methods have limitations based on costs, logistics, practicality, or effectiveness. There are also regulatory constraints on the availability and use of some MDM techniques. Mammal damage management methods currently available to the Missouri WS program are described here. If other methods are proven effective and legal to use in Missouri, they could be incorporated into the MO WS program, pursuant to permits, other authorizations, agreements with landowners, NEPA compliance, and other laws, regulations, and policies.

NONLETHAL METHODS-NONCHEMICAL

Cultural Methods and Habitat Management includes the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment to deter animals from entering a protected area, removal of trees from around buildings to reduce access by squirrels and raccoons, or planting lure crops on fringes of protected crops. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies. Some mammals which cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted mammals. If raccoons and opossums are a problem, making trash and garbage unavailable and removing all outside pet food during nighttime hours can reduce their presence. If tree squirrels are damaging property or causing a nuisance, care in preventing them from obtaining bird seed left in bird feeders can often greatly reduce their presence. This may mean hanging bird feeders by thin wire from tree limbs, or constructing mounting poles which cannot be climbed by these animals.

Animal Behavior Modification. This refers to tactics that deter or repel damaging mammals and thus, reduce damage to the protected resource. These techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli (e.g., flashing lights). Unfortunately, many of these techniques are only effective for a short time before animals habituate (i.e., learn there is not a real threat; Conover 1982). Combining frightening stimuli and regularly changing the location, source and type of stimuli can extend the protective period of nonlethal methods. Using motion activated systems instead of systems which are activated on regular intervals may also extend the effective period for a frightening devices. Devices used to modify behavior in mammals include:

- Electronic guards (siren / strobe-light devices)
- Propane exploders
- Pyrotechnics
- Laser lights
- Human effigies

Wildlife – Exclusion. Physical exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing of culverts, drain pipes, and other water control structures may prevent raccoons and other animals from using these as travel corridors. In those applications, however, consideration must be given for water flow so that the fence does not act to catch and hold water-borne debris. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species which dig, including coyotes, foxes, skunks, and woodchucks. Areas such as airports, yards or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of mammals into buildings through existing holes or gaps. Electric fences of various constructions have been used effectively to reduce damage to various crops by deer, raccoons, bears and other species (Hygnstrom and Craven 1994, Boggess 1994).

Relocation of damaging mammals to other areas following live capture is generally not effective or cost-effective. Habitats in other areas may already be at carrying capacity, and relocation would most likely result in damage problems at the new location. Relocated animals can have poor survival rates at the new site (Rosatte and MacInnes 1989, Wright 1978, Frampton and Webb 1974) although careful timing of relocation and selection of release site can markedly improve survival rates (Griffith et al. 1989). Relocating animals also runs the risk of spreading parasites and diseases to previously uninfected areas. For example, the spread of raccoon variant of rabies in the eastern U.S. was likely unintentionally accelerated through the translocation of infected raccoons (Krebs et al. 1999). Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions for the relocation of damaging mammals that might be a viable solution, such as when they are considered to have high value such as T&E species. Under the right conditions, relocating wildlife can be a viable and effective wildlife management technique (Craven et al. 1998). Missouri WS would only relocate wildlife at the direction of and only after consulting with the MDC to coordinate capture, transportation, and selection of suitable relocation sites, as well as compliance with all proper guidelines.

Animal Capture Devices:

WS specialists can use a variety of devices to capture mammals. For reasons discussed above under Relocation, captured animals are usually killed via gunshot, cervical dislocation, or one of the chemical euthanasia methods listed below. However there are occasions where captured animals are relocated, or, in the case of some disease surveillance projects, may be released on site.

Foothold traps are small traps that come in a variety of sizes that allows the traps to be species specific of some degree. These traps are can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws, which hold the animal. Pan tension devices which increase the pressure required to release the trigger on the trap can reduce risks to non-target species.

Cage traps are live capture traps used to trap a variety of small to medium sized mammals. Cage traps come in a many sizes and are generally made of galvanized wire mesh and are triggered by a treadle in the middle of the cage that closes the door behind the animal being trapped. Cage traps can range from the extremely small, intended for the capture of rodents and other small mammals, to the large corral/panel traps used to live-capture feral hogs.

Sherman box traps are small live traps used to capture small mammals such as rodents. These traps are often made of galvanized steel or aluminum and fold up for easy transport. Sherman box traps also consist of a treadle towards the back of the trap that triggers the door to close behind the animal being trapped.

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the snare the loop becomes smaller in size, holding the animal as if it were on a leash. In Missouri, when used as a live capture device, snares are equipped with integrated stops that permit snaring, but do not choke the animal. Breakaway snares are snares designed to brake open and release with tension exerted by larger non-target animals such as deer, antelope and livestock.

Bow nets are small circular net traps used for small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord.

Hand nets are used to catch small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles

Net guns are devices used to trap mammals. The devices project a net over at target using a specialized gun

Cannon nets use an explosive charge to fire projectiles dragging a net over the baited target area.

Air cannon nets are similar to cannon nets, but are propelled by compressed air.

NON-LETHAL METHODS – CHEMICAL

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Once in the soil, zinc phosphide rapidly creates phosphine when it comes into contact with soil moisture, which is either released into the atmosphere or converted into phosphates and zinc complexes. Translocation of phosphine has been demonstrated, but it is rapidly converted to harmless phosphates. Use of zinc phosphide on various types of fruit, vegetable, or cereal baits has proven to be effective at suppressing local populations of target animals. Specific bait applications are designed to minimize non-target hazards.

Zinc phosphide is 2 to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Brock 1965, Evans et al. 1970, Schitoskey 1975, Bell and Dimmick 1975, Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Matscke et al. 1983, Marsh 1987, Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) most rodents die in their burrows and are unavailable to raptors and scavengers (Knowles 1986), and 4) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Tkadlec and Rychnovsky 1990, Johnson and Fagerstone 1994). Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents (USDA 1997).

Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. They determined that no differences were observed between pretreatment and post-treatment populations of eastern cottontail rabbits (Sylvilagus floridanus) and white-tailed jackrabbits (Lepus townsendii). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (Peromyscus maniculatus) populations in areas treated with zinc phosphide, but the effect was not statistically significant because deer mouse densities are highly variable and the reduction was short-lived (Deisch et al. 1990). Matschke and Andrews (unpubl.) reported no mortality or signs of poisoning or emesis in ferrets after 3 days of feeding on zinc phosphide killed prairie dogs, prompting the investigators to conclude that the risk of ferret secondary poisoning from zinc phosphide was low.

Ramey et al. (2000) reported that 5 weeks after treatment, no ring-necked pheasants (Phasianus colchicus) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (Eremophila alpestris) and mourning doves (Zenaida macroura) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (i.e., bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982) and Matschke et al. (1983).

Deisch et al.(1989) studied the effect that zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, but spider mites, crickets, wolf spiders, ground beetles, darkling beetles, and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989).

Strychnine is a white, bitter-tasting pesticide that is highly toxic to most species of mammals and birds, with the exception of gallinaceous birds. It is available for below-ground use only to reduce gopher (*Thomomys spp.* and *Geomys spp.*) damage. Above-ground uses of strychnine were canceled in 1988 because of the high potential for non-target take. Four formulations are currently available for use in the United States; two are restricted-use and two are general use. Strychnine is available on milo and oats for use with mechanical burrow builders or hand placement. Burrow builders create underground burrows and drop baits in them. Gophers intersect these burrows, consume the baits, and die underground. Baits can also be placed in active burrow systems by hand. Gophers that consume these baits mostly die underground. Non-target species that use gopher burrow systems such as field mice (i.e., *Peromyscus spp, Zapus spp., Reithrodontomys spp., Onychomys spp., Microtus spp.*), chipmunks (*Eutamias spp.*), and jackrabbits (*Lepus* spp.) are a primary non-target hazards. Strychnine kills animals relatively quickly and unassimilated baits can be found in the gut contents. Some primary non-targets, and few gophers may potentially die above ground and pose a potential risk of secondary hazards to scavengers; this hazard has been shown to be quite low. Since strychnine poses at least the potential of secondary poisoning , it is conceivable that a smaller predatory or scavenger species could be affected by consuming targeted gophers. Strychnine is used mostly to protect alfalfa in the United States, but has been used to protect other agricultural resources and forests. WS rarely uses strychnine operationally.

Gas cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow, the resultant carbon monoxide and other gases cause asphyxiation. The risks assessment for the use of gas cartridges for rodent management in (USDA 1997 Revised) state that the only risks to non-target species are risks to rodents and other species found in burrows with the target species. WS will not use gas cartridges in areas where State or Federally listed species may be in burrows with the target animals.

Anticoagulant rodenticides come in a variety of formulations and many are available as rodenticides from commercial vendors. WS would only use anticoagulant rodenticides in areas near homes, buildings and other structures which should reduce exposure to non-target species. Anticoagulants come in single dose and multiple dose formulations. The active ingredients in anticoagulants used by WS include bromadiolone, brodifacoum, chloraphacinone, difethialone, and diphacinone. These baits, following single or multiple feedings (depending upon type), reduce the clotting ability of blood and damage capillaries. Over time, the rate of blood clotting slowly decreases and blood loss from the damaged capillaries leads to death. Primary hazards must be guarded against by placing baits in containers or other inaccessible areas to pets, children, livestock, and non-target species because anticoagulants are toxic to other species, especially mammals, at low concentrations. Non-target hazards are mitigated through bait formulation and design and placement of bait boxes. For example, use of block formulations of bait prevents bait from being shaken or spilled out of bait boxes. Tamper resistant bait stations and design of the size of the entry hole also reduces risk to nontarget species. Anticoagulants, especially brodifacoum, difethialone, and bromadiolone also have a high potential for secondary poisoning. However, these risks are somewhat mitigated by the fact that predator scavengers would usually need exposure to multiple carcasses over a period of days in order to experience toxic effects. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions.

APPENDIX C:

CONSULTATION ON FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES

23 June 2006

Charlie Scott
USDI, Fish and Wildlife Service
Ecological Services Office
101 Park DeVille Drive, Suite A
Columbia, MO 65203

Dear Mr. Scott,

This letter initiates the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Service (WS) request for an informal consultation on its proposed program to manage damage caused by wild and feral mammals in Missouri. The following analysis was made using endangered species lists obtained from the United States Department of the Interior, Fish and Wildlife Service web site on June 2, 2006.

Two existing consultations are relevant to the proposed action: the 1992 Biological Opinion from the USFWS on the national Wildlife Services program (USDA 1997 Revised) and a February 7, 2001 consultation with your office regarding wildlife hazard and damage management at airports in Missouri (USDA 2001). The new mammal damage management EA includes management of hazards and damage associated with mammals at airports. When completed, the new EA on mammal damage management and existing statewide EAs on bird (USDA 2002) and aquatic rodent (USDA 2005) damage management will replace the 2001 EA on wildlife hazard and damage management at airports.

PROJECT AREA AND SUMMARY

The purpose of this EA is to address and evaluate the potential impacts on the human environment from alternatives for WS involvement in the protection of agricultural resources, natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Missouri. Damage problems can occur throughout the State. Under the Proposed Action, MDM could be conducted on private, federal, state, tribal, county, and municipal lands in Missouri where damage occurs and a request for assistance is received by WS.

Several mammal species have potential to be the subject of WS Mammal Damage Management (MDM) activities in Missouri. Mammal species addressed in this EA include but are not limited to: white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), mink/weasels (*Mustela* spp.), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), feral cats (*Felis catus*), striped skunk (*Mephitis mephitis*), badger (*Taxidea taxus*), river otter (*Lutra canadensis*), woodchuck (*Marmota monax*), nine-banded armadillo (*Dasypus novemcinctus*), feral swine (*Sus scrofa*), domestic/feral dog (*Canis familiaris*), brown (Norway) rat (*Rattus norvegicus*), black (roof) rat (*Rattus rattus*), house mouse (*Mus musculus*), Eastern cottontail rabbit (*Sylvilagus floridanus*), thirteen-lined ground squirrel (*Spermophilus tridecimlineatus*), Eastern gray squirrel, (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), Eastern mole (*Scalopus aquaticus*), plains pocket gopher (*Geomys bursarius*), mice (*Peromyscus* spp.), and voles (*Microtus* spp.). This EA does not address the management of damage or risks to human safety caused by aquatic rodents. Management of damage and risks to human safety caused by aquatic rodents is covered in a separate analysis (USDA 2005). The EA allows for management of rodent damage by species other than those listed above so long as the methods to be used have been analyzed in the EA and take does not exceed 20 individuals per species. The EA specifically states the WS will consult with and obtain any necessary permits from the Missouri Department of Conservation and/or the USFWS prior to conducting any mammal damage management involving a State or Federally listed species.

PROPOSED ACTION - SPECIFIC METHODS USED

Damage management efforts would be targeted at specific offending mammals or groups of mammals, and, with the possible exception of efforts to reduce feral hogs, are not intended to reduce wildlife populations in the State or Region. Depending upon the alternative selected, the specific control methods and techniques that could be used are described below. Table 1 summarizes the damage management methods most likely to be used for specific wildlife species targeted in the EA.

NON-LETHAL METHODS: NON-CHEMICAL

Cultural Methods and Habitat Management involve the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment to deter animals from entering a protected area, removal of trees from around buildings to reduce access by squirrels and raccoons, or planting lure crops on fringes of protected crops. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies. Some mammals which cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted mammals. If raccoons and opossums are a problem, making trash and garbage unavailable and removing all outside pet food during nighttime hours can reduce their presence. If tree squirrels are damaging property or causing a nuisance, care in preventing them from obtaining bird seed left in bird feeders can often greatly reduce their presence. This may mean hanging bird feeders by thin wire from tree limbs, or constructing mounting poles which cannot be climbed by these animals. In almost all instances, WS only recommends and advises property managers on the use of these methods. Actual implementation of the methods is the responsibility of the property manager. In instances where the recommendation may impact habitat used by a Federally-listed species, WS will advise the property manager to contact the USFWS prior to initiating work.

Animal Behavior Modification. This refers to tactics that frighten or repel damaging mammals and thus, reduce damage to the protected resource. These techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli (e.g., flashing lights). Some devices broadcast recordings of alarm or distress calls of the target species. Unfortunately, many of these techniques are only effective for a short time before animals habituate (i.e., learn there is not a real threat; Conover 1982). Combining frightening stimuli and regularly changing the location, source and type of stimuli can extend the protective period of non-lethal methods. Using motion activated systems instead of systems which are activated on regular intervals may also extend the effective period for a frightening devices. Devices used to modify behavior in mammals include:

- Electronic guards (siren / strobe-light devices)
- Propane exploders
- Pyrotechnics
- Laser lights
- Human effigies

Wildlife – Exclusion. Physical exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing of culverts, drain pipes, and other water control structures may prevent raccoons and other animals from using these as travel corridors. In those applications, however, consideration must be given for water flow so that the fence does not act to catch and hold water-borne debris. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species which dig, including coyotes, foxes, skunks, and woodchucks. Areas such as airports, yards or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of mammals into buildings through existing holes or gaps. Electric fences of various constructions have been used effectively to

reduce damage to various crops by deer, raccoons, bears and other species (Hygnstrom and Craven 1994, Boggess 1994).

Relocation of damaging mammals to other areas following live capture is generally not effective or cost-effective. Habitats in other areas may already be at carrying capacity, and relocation would most likely result in damage problems at the new location. Relocated animals can have poor survival rates at the new site (Rosatte and MacInnes 1989, Wright 1978, Frampton and Webb 1974) although careful timing of relocation and selection of release site can markedly improve survival rates (Griffith et al. 1989). Relocating animals also runs the risk of spreading parasites and diseases to previously uninfected areas. For example, the spread of raccoon variant of rabies in the eastern U.S. was likely unintentionally accelerated through the translocation of infected raccoons (Krebs et al. 1999). Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions for the relocation of damaging mammals that might be a viable solution, such as when they are considered to have high value such as T&E species. Under the right conditions, relocating wildlife can be a viable and effective wildlife management technique (Craven et al. 1998). Missouri WS would only relocate wildlife at the direction of and only after consulting with the MDC to coordinate capture, transportation, and selection of suitable relocation sites, as well as compliance with all proper guidelines.

Animal Capture Devices:

WS specialists can use a variety of devices to capture mammals. For reasons discussed above under Relocation, captured animals are usually killed via gunshot, cervical dislocation, or chemical euthanasia. However there are occasions where captured animals are relocated, or, in the case of some disease surveillance projects, may be released on site.

Foothold traps are small traps that come in a variety of sizes that allows the traps to be species specific of some degree. These traps are can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws, which hold the animal. Pan tension devices which increase the pressure required to release the trigger on the trap can reduce risks to smaller non-target species.

Cage traps are live-capture traps used to trap a variety of small to medium sized mammals. Cage traps come in a many sizes and are generally made of galvanized wire mesh and are triggered by a treadle in the middle of the cage that closes the door behind the animal being trapped. Cage traps can range from the extremely small, intended for the capture of rodents and other small mammals, to the large corral/panel traps used to live-capture feral hogs.

Sherman box traps are live traps used to capture small mammals such as rodents. These traps are often made of galvanized steel or aluminum and fold up for easy transport. Sherman box traps have a treadle near the back of the trap that triggers the door to close behind the animal being trapped.

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the snare the loop becomes smaller in size, holding the animal as if it were on a leash. In Missouri, when used as a live capture device, snares are equipped with integrated stops that permit snaring, but do not choke the animal. Breakaway snares are snares designed to break open and release with tension exerted by larger non-target animals such as deer and livestock.

Bow nets are small circular net traps used for small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord.

Hand nets are used to catch small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles

Net guns and cannon nets are devices used to trap mammals. The devices project a net over at target using a specialized gun or other device to carry the net.

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Once in the soil, zinc phosphide rapidly creates phosphine when it comes into contact with soil moisture, which is either released into the atmosphere or converted into phosphates and zinc complexes. Translocation of phosphine has been demonstrated, but it is rapidly converted to harmless phosphates. Use of zinc phosphide on various types of fruit, vegetable, or cereal baits has proven to be effective at

suppressing local populations of target animals. Specific bait applications are designed to minimize non-target hazards.

Zinc phosphide is 2 to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Brock 1965, Evans et al. 1970, Schitoskey 1975, Bell and Dimmick 1975, Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Matscke et al. 1983, Marsh 1987, Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) most rodents die in their burrows and are unavailable to raptors and scavengers (Knowles 1986), and 4) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Tkadlec and Rychnovsky 1990, Johnson and Fagerstone 1994). Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents (USDA 1997 Revised).

Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. They determined that no differences were observed between pretreatment and post-treatment populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, but the effect was not statistically significant because deer mouse densities are highly variable and the reduction was short-lived (Deisch et al. 1990). Matschke and Andrews (unpubl.) reported no mortality or signs of poisoning or emesis in ferrets after 3 days of feeding on zinc phosphide killed prairie dogs, prompting the investigators to conclude that the risk of ferret secondary poisoning from zinc phosphide was low.

Ramey et al. (2000) reported that 5 weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (i.e., bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982) and Matschke et al. (1983).

Deisch et al.(1989) studied the effect that zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, but spider mites, crickets, wolf spiders, ground beetles, darkling beetles, and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989).

Strychnine is a white, bitter-tasting pesticide that is highly toxic to most species of mammals and birds, with the exception of gallinaceous birds. It is available for below-ground use only to reduce gopher (*Thomomys spp.* and *Geomys spp.*) damage. Above-ground uses of strychnine were canceled in 1988 because of the high potential for non-target take. Four formulations are currently available for use in the United States; two are restricted-use and two are general use. Strychnine is available on milo and oats for use with mechanical burrow builders or hand placement. Burrow builders create underground burrows and drop baits in them. Gophers intersect these burrows, consume the baits, and die underground. Baits can also be placed in active burrow systems by hand. Gophers that consume these baits mostly die underground (Nolte and Wagner 2001). Non-target species that use gopher burrow systems such as field mice (i.e., *Peromyscus spp, Zapus spp., Reithrodontomys spp., Onychomys spp., Microtus spp.*), chipmunks (*Eutamias spp.*), and jackrabbits (*Lepus* spp.) are a primary non-target hazards. Strychnine kills animals relatively quickly and unassimilated baits can be found in the gut contents. Some primary non-targets, and few gophers may potentially die above ground and pose a potential risk of secondary hazards to scavengers; this hazard has been shown to be quite low. Since strychnine poses at least the potential of secondary poisoning, it is conceivable that a smaller predatory or scavenger species could be affected by consuming targeted gophers. Strychnine is used mostly to protect alfalfa in the United States, but has been used to protect other agricultural resources and forests. WS rarely uses strychnine operationally.

Gas cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow, the resultant carbon monoxide and other gases cause asphyxiation. The risks assessment for the use of gas cartridges for rodent management in (USDA 1997 Revised) state that the only risks to non-target species are risks to rodents and other species found in burrows with the target species. WS will not use gas cartridges in areas where State or Federally listed species may be in burrows with the target animals.

Anticoagulant rodenticides come in a variety of formulations and many are available as rodenticides from commercial vendors. WS would only use anticoagulant rodenticides in areas near homes, buildings and other structures which should reduce exposure to non-target species. Anticoagulants come in single dose and multiple dose formulations. The active ingredients in anticoagulants used by WS include bromadiolone, brodifacoum, chloraphacinone, difethialone, and diphacinone. These baits, following single or multiple feedings (depending upon type), reduce the clotting ability of blood and damage capillaries. Over time, the rate of blood clotting slowly decreases and blood loss from the damaged capillaries leads to death. Primary hazards must be guarded against by placing baits in containers or other inaccessible areas to pets, children, livestock, and non-target species because anticoagulants are toxic to other species, especially mammals, at low concentrations. Non-target hazards are mitigated through bait formulation and design and placement of bait boxes. For example, use of block formulations of bait prevents bait from being shaken or spilled out of bait boxes. Tamper resistant bait stations and design of the size of the entry hole also reduces risk to nontarget species. Anticoagulants, especially brodifacoum, difethialone, and bromadiolone also have a high potential for secondary poisoning. However, these risks are somewhat mitigated by the fact that predator scavengers would usually need exposure to multiple carcasses over a period of days in order to experience toxic effects. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions.

EVALUATION OF IMPACTS

WS would not be conducting any habitat management activities, although we recommend habitat management as a damage management strategy. In these instances, WS will remind landowners of the potential for impacting federally listed species and advise that the property owner/manager consult with the USFWS prior to initiating any habitat management activities. However, as discussed below, some WS activities may have beneficial impacts on habitat used by some species. Federally listed species would only be adversely impacted by the proposed action if they are accidentally caught in capture devices or consume bait intended for another species.

MAMMALS

Gray Bat *(Myotis grisescens)*
Indiana Bat *(Myotis sodalist)*
Ozark big-eared bat *(Plecotus townsendii ingens)*

Most of Missouri WS' involvement in bat damage management is limited to providing technical assistance. Technical assistance provided by WS is similar to that in (Pierce and Clawson 2006). Technical advice includes recommendations to avoid using exclusion devices until young can leave the site to avoid orphaning/killing young bats. Where applicable, WS will make the property owner/manager aware of the possibility that there may be a federally listed bat at the site and will provide the property manager with information on how to contact the USFWS regarding listed bats.

Occasionally (once or twice a year), WS receives a requested to assist with a threat to human heath and safety related to bats (e.g., a bat has bitten or scratched some one and WS is requested to capture the bat so it can be tested for rabies, or a request to remove a bat from a public building). Over the period of 2003-2005 WS captured and released 2 bats and hazed a third from a site where it was causing concerns. The areas where WS provides this type of assistance are generally not the type of habitat used by the Federally-listed bats in Missouri. WS personnel who respond to requests for assistance with bats will be trained in the identification of federally-listed bats in Missouri. In the event that the problem appears to be related to a federally listed bat, WS will contact the USFWS Missouri Field Office. Given the extremely low likelihood that a Federally-listed bat will be at the sites where WS provides assistance and the low frequency of WS' direct assistance with bat management and that WS' actions rarely result in the death of the bat, the proposed action may affect but is unlikely to adversely affect the gray bat, Indiana bat or Ozark big-eared bat.

FISH, MOLLUSKS, INSECTS, SNAILS, REPTILES and AMPHIBIANS

Arkansas darter (*Etheostoma cragini*)
Grotto sculpin (Cottus sp.)
Neosho madtom (*Noturus placidus*)
Niangua darter (*Etheostoma nianguae*)
Ozark cavefish (*Amblyopsis rosae*)
Pallid sturgeon (*Scaphirhynchus albus*)
Topeka shiner (*Notropis Topeka*)
Curtis' pearlymussel (*Epioblasma flornetina curtisi*)
Fat pocketbook (*Potamilus capax*)
Higgins eye pearlymussel (*Lampsilis Higgins)*
Neosho Mucket *(Lampsilis orbiculata)*
Pink mucket pearlymussel *(Lampsilis rafinesqueana)*
Scaleshell *(Leptodea leptodon))*
Sheepnose mussel (*Plethobasus cyphyus)* .....
Spectaclecase (*Cumberlandia monodonta*)
Winged mapleleaf (*Quadrula fragosa*
Hines Emerald Dragonfly (*Somatochlora hineana*)
Tumbling creek cavesnail (*Antrobia culveri*)
Cave crayfish (*Cambarys aculabrum*)
Eastern massasauga (*Sistrurus catenatus*)
Ozark hellbender (*Cryptobranchus alleganiensis*)

In general, the activities proposed in this EA will have no effect on these species. However, it is possible that damage to riparian areas and other habitats by feral swine may cause adverse impacts on Federally-listed species. In these instances, WS removal of feral swine would be beneficial to federally listed species. For these reasons, the proposed action may affect but are unlikely to adversely affect Federally-listed fish and mollusks in Missouri.

Feral swine populations in 3 counties in Missouri utilize riparian areas causing severe damage and sometimes loss to vegetation and stream bank stabilization by their rooting and wallowing. The federally listed endangered Hine's

emerald dragonfly's is also directly affected by feral swine. Just recently discovered in Missouri, the dragonfly has an unknown status in the state and is found in Reynolds County located in the Missouri Ozark fen complex. Feral swine utilize these fens to wallow in, frequently causing significant damage. The Hine's emerald dragonfly deposits its eggs in slow moving streams also utilized by feral swine. The Federal and State endangered tumbling creek cavesnail's only known population in the world is in Taney County where rooting and wallowing by feral swine in the recharge area of Tumbling creek cave has resulted in increased erosion and increased populations of invasive plant species. The loss of vegetation in these riparian areas leads to increased siltation and chemical runoff which negatively affects all Karst species including the Federal and State threatened Ozark Cavefish.

VASCULAR PLANTS

Decurrent false aster (*Boltonia decurrens*)
Geocarpon (*Geocarpon minimum*)
Mead's milkweed (*Asclepias meadii*)
Missouri bladder-pod (*Lesquerella filiformis*)
Pondberry (*Lindera melissifolia*)
Running buffalo clover (*Trifolium stoloniferum*)
Virginia sneezeweed (*Helenium virginicum*)
Western prairie fringed orchid *(Platanthera praeclara)*

In general, WS' MDM activities will have no impact on federally-listed plants. However, in some situations, feral swine may damage habitat needed for listed plants. For example, feral swine have damaged the federally threatened and State endangered Mead's milkweed by rooting up the plant during feeding. The plant's igneous glade habitat found in the Missouri Ozarks has also been damaged by feral swine rooting activity. WS' removal of feral swine may have beneficial impacts on species adversely impacted by feral swine. Therefore, the proposed action may affect but is unlikely to adversely affect federally-listed plants.

BIRDS

Piping plovers (*Charadrius melodus*) breed and raise young mainly on sparsely vegetated beaches, cobble pans, and sand spits of glacially-formed sand dune ecosystems along the Great Lakes shoreline. Piping plovers feed primarily on exposed beach substrates by pecking for invertebrates one centimeter (0.4 in) or less below the surface (Cairns 1977; Whyte 1985). Diet generally consists of invertebrates, including insects, marine worms, crustaceans, and mollusks (Haig 1992). WS does not currently anticipate conducting bird damage management activities in sites used by piping plovers, and plovers are not attracted to the foods used by WS as bait to deliver pesticides. The only MDM likely to be conducted at sites used by plovers are projects intended to reduce predation on nesting adult plovers, their eggs and/or young. WS will reinitiate consultation with the USFWS prior to initiating any project for the protection of this species. Therefore, WS concludes the proposed action will have no effect on piping plovers.

Least terns (*Sterna antillarum*) use barren to sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines. Least terns feed on small fish and will not be attracted to the foods used by WS to deliver pesticides. As with piping plovers, the only MDM likely to be conducted at sites used by terns are projects intended to reduce predation on nesting adult terns, their eggs and/or young. WS will reinitiate consultation with the USFWS prior to initiating any project for the protection of this species. Therefore, the proposed action will have no effect on piping plovers.

Bald Eagle (*Haliaeetus leucocephalus*). Risks associated with all of these methods were analyzed in the 1992 Biological Opinion from the USFWS on the National WS program (USDA 1997 Revised). Findings from the national consultation are still applicable to the proposed mammal damage management program in Missouri. We are providing information on the consultation for your information. We are not initiating consultation on the impacts of Missouri WS impacts on eagles at this time.

The USFWS concluded that the above ground use of strychnine and foot-hold traps were the only methods likely to pose a risk to bald eagles, below ground use of strychnine was not identified as a risk to eagles. Above ground use of strychnine bait is no longer permitted by the US EPA. We have copied the relevant Reasonable and Prudent

measures and Terms and Conditions for the protection of eagles from the 1992 biological opinion below for your reference.

The USFWS 1992 biological opinion provides for incidental take of eagles and lists the following reasonable and prudent measure relevant to the WS predation management program in Missouri

1) When bald eagles are in the immediate vicinity of a proposed control program, ADC [WS] personnel must conduct daily checks for carcasses or trapped individuals. Carcasses of target animals taken with any chemical that may pose a secondary poisoning hazard must be immediately removed and disposed of in a manner that prevents scavenging by any nontarget species.

The 1992 Biological Opinion also established the following terms and conditions.

1) WS personnel shall contact either the local state fish and game agency or the appropriate regional or field office of the Service to determine nest and roost locations.
2) The appropriate USFWS office shall be notified within 5 days of the finding of any dead or injured bald eagle. Cause of death, injury or illness, if known, should be provided to those offices.
3) Foothold traps shall be places a minimum of 30 feet from above-ground bait (meat) sets.

A new national consultation for the WS program is in progress. Once completed, WS will adhere to provisions for the protection of federally listed species provided in that consultation.

Thank you for your assistance with this consultation. If you need any additional information or if there is anything I may do to be of assistance please feel free to contact me.

Sincerely,

Robert C. Alexander
Wildlife Specialist

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APPENDIX D:

CONSULTATION ON STATE-LISTED THREATENED AND ENDANGERED SPECIES

October 31, 2006

Mr. Robert C. Alexander
Animal and Plant Health Inspection Service
Wildlife Services
11579 Natural Bridge Road
Bridgeton, MO 63044

Dear Mr. Alexander:

RE: Environmental Assessment: Reducing Mammal Damage in Missouri (EA)

The Missouri Department of Conservation (Department) is grateful for the opportunity to review the above referenced document and the associated document of September 22, 2006, which analyzes impacts to state-listed endangered species. The Department has an excellent working relationship with your agency. We know Wildlife Services works diligently to minimize impact to and avoid unnecessary loss of Missouri state-listed endangered species, while meeting its goals and objectives for reducing wildlife damage.

Department personnel from our Private Land Services Division, who work with wildlife damage issues, and Department experts of state-listed endangered species reviewed the EA and associated document. To summarize our review, the Department agrees with Wildlife Services' conclusion that the proposed actions will not adversely impact populations of any state-listed endangered species, and may in fact benefit several state-listed species through removal of damaging species, such as feral hogs, that destroy habitat important to these species. However, we offer several comments below that we would like to bring to your attention that will help to better manage these state-listed endangered species in Missouri.

1. Given the scarcity of the state-endangered spotted skunk (*Spilogale putorius*) and black-tailed jackrabbit (*Lepus californicus*), we request that consideration be given to relocating specimens of these species, in the unlikely event they are the target species and are captured by Wildlife Services staff. We recognize that relocation may not be possible in every instance; however continued coordination with an agent of the Department will help if the need for relocation does arise.

   This request is consistent with the statement on page 3, second full paragraph under the Relocation Section of the September 22 document, that "...there are exceptions for the relocation of damaging mammals that might be a viable solution..." and "...Missouri Wildlife Services would only relocate wildlife at the direction of and only after consulting with the MDC to coordinate capture, transportation and selection of suitable relocation sites...." The latter statement is also consistent with Missouri's Wildlife Code, 3 CSR 10-4.130 Owner May Protect Property (4), which states "Deer, turkey, black bears and endangered species that are causing damage may be killed only with the permission of an agent of the department and by methods authorized by him/her."

2. Long-tailed weasel (*Mustela frenata*) and least weasel (*M. nivalis*) are both listed in **Missouri's Species and Communities of Conservation Concern Checklist**. While neither species is listed endangered in Missouri, population numbers are believed to have declined and we are still learning about their distribution in Missouri. Should specimens of either species be captured alive and are the target species, please consider relocation, if possible. If specimens are captured dead, we would like to know the location of the capture to help better identify species distribution. Location information can be sent to Debby Fantz, wildlife research scientist, at the Department's Resource Science Center, 1110 South College Avenue, Columbia, MO 65201. Ms. Fantz can be contacted at 573-882-9909.

3. It is possible that anticoagulant rodenticides could be harmful to barn owls (*Tyto alba*), which is a state-listed endangered species in Missouri. This raptor hunts and eats rodents and often nests in old barns or other farm buildings. Anticoagulant rodenticides are typically placed near structures, and barn owls could be secondarily poisoned. However, I understand that Wildlife Services does not typically use this type of control (October 31, 2006, phone conversation with Mr. Robert Alexander) and therefore the potential for adverse impact to barn owls is extremely low.

   In the unlikely event that this type of control is necessary, we recommend using caution if using anticoagulant rodenticides near known and active barn owl nests. This owl will stay close to the nests until the young birds fledge and thus could be susceptible to multiple exposures. As noted in the EA, prompt removal of rodent carcasses in areas inhabited by barn owls, as directed on the labels of rodenticides, will reduce the potential for secondary poisoning. The breeding season for barn owls is mid-May through mid-August. Barn owls are most likely to be found in the southeast portion of Missouri, and we have often found that resident landowners know when a pair is nesting nearby.

Thank you for the opportunity to review and provide comment on the EA and associated document. We appreciate Wildlife Services' consideration of impacts to Missouri's endangered species. As previously mentioned, following the proposed action should not be detrimental to populations of Missouri's state-listed species. While the risk of encountering most of Missouri's state-listed endangered species during wildlife damage operations is low, consideration of our comments could further help reduce potential for impacting individual specimens of these rare species.

Should you have any questions on these comments, please contact me at 573-522-4115 Extension 3372, or by e-mail at janet.sternburg@mdc.mo.gov.

Sincerely,

JANET E. STERNBURG
POLICY COORDINATOR

c: Peggy Horner, Rex Martensen, Missouri Department of Conservation

22 September 2006

Peggy Horner
Endangered Species Coordinator
P.O. Box 180
Jefferson City, MO 65102-0180

Dear Ms. Horner

The United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Service (WS) would like to consult with the Missouri Department of Conservation regarding the potential impacts of a proposed mammal damage management (MDM) program on state-listed endangered species. WS' is initiating this consultation as part of an environmental analysis (EA) on alternatives for managing damage caused by wild and feral mammals in Missouri. A copy of the draft EA that was made available for public comment is attached. The analysis in the EA excludes management of damage caused by aquatic rodents which is addressed in a separate EA. WS has completed a separate informal Section 7 consultation with the USFWS for this project. The USFWS has concurred with WS determination that the proposed action will either have no effect on or may effect but is unlikely to adversely affect Federally-listed Threatened and Endangered Species. The USFWS also concurs with WS' determination that feral swine removal projects may have beneficial impacts on some federally listed species and their habitats.

WS has prepared the following analysis of impacts on state-listed endangered species using the list provided in the *Missouri Species and Communities of Conservation Concern – Checklist January 2006*. The following analysis was made using endangered species lists obtained from the United States Department of the Interior, Fish and Wildlife Service web site on June 2, 2006.

PROJECT AREA AND SUMMARY

The purpose of this EA is to address and evaluate the potential impacts on the human environment from alternatives for WS involvement in the protection of agricultural resources, natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Missouri. Damage problems can occur throughout the State. Under the Proposed Action, MDM could be conducted on private, federal, state, tribal, county, and municipal lands in Missouri where damage occurs and a request for assistance is received by WS.

Several mammal species have potential to be the subject of WS Mammal Damage Management (MDM) activities in Missouri. Mammal species addressed in this EA include but are not limited to: white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), mink/weasels (*Mustela* spp.), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), feral cats (*Felis catus*), striped skunk (*Mephitis mephitis*), badger (*Taxidea taxus*), river otter (*Lutra canadensis*), woodchuck (*Marmota monax*), nine-banded armadillo (*Dasypus novemcinctus*), feral swine (*Sus scrofa*), domestic/feral dog (*Canis familiaris*), brown (Norway) rat (*Rattus norvegicus*), black (roof) rat (*Rattus rattus*), house mouse (*Mus musculus*), Eastern cottontail rabbit (*Sylvilagus floridanus*), thirteen-lined ground squirrel (*Spermophilus tridecimlineatus*), Eastern gray squirrel, (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), Eastern mole (*Scalopus aquaticus*), plains pocket gopher (*Geomys bursarius*), mice (*Peromyscus* spp.), and voles (*Microtus* spp.). This EA does not address the management of damage or risks to human safety caused by aquatic rodents. Management of damage and risks to human safety caused by aquatic rodents is covered in a separate analysis (USDA 2005). The EA allows for management of rodent damage by species other than those listed above so long as the methods to be used have been analyzed in the EA and take does not exceed 20 individuals per species. The EA specifically states the WS will consult with and obtain any necessary permits from the MDC and/or the USFWS prior to conducting any mammal damage management involving a State or Federally listed species.

PROPOSED ACTION - SPECIFIC METHODS USED

Damage management efforts would be targeted at specific offending mammals or groups of mammals, and, with the possible exception of efforts to reduce feral hog populations, would not be intended to reduce wildlife populations in the State or Region. Depending upon the alternative selected, the specific control methods and techniques that could be used are described below.

NON-LETHAL METHODS: NON-CHEMICAL

Cultural Methods and Habitat Management involve the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment to deter animals from entering a protected area, removal of trees from around buildings to reduce access by squirrels and raccoons, or planting lure crops on fringes of protected crops. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies. Some mammals which cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted mammals. If raccoons and opossums are a problem, making trash and garbage unavailable and removing all outside pet food during nighttime hours can reduce their presence. If tree squirrels are damaging property or causing a nuisance, care in preventing them from obtaining bird seed left in bird feeders can often greatly reduce their presence. This may mean hanging bird feeders by thin wire from tree limbs, or constructing mounting poles which cannot be climbed by these animals. In almost all instances, WS only recommends and advises property managers on the use of these methods. Actual implementation of the methods is the responsibility of the property manager. In instances where the recommendation may impact habitat used by a Federally-listed species, WS will advise the property manager to contact the USFWS prior to initiating work.

Animal Behavior Modification. This refers to tactics that frighten or repel damaging mammals and thus, reduce damage to the protected resource. These techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli (e.g., flashing lights). Some devices broadcast recordings of alarm or distress calls of the target species. Unfortunately, many of these techniques are only effective for a short time before animals habituate (i.e., learn there is not a real threat; Conover 1982). Combining frightening stimuli and regularly changing the location, source and type of stimuli can extend the protective period of non-lethal methods. Using motion activated systems instead of systems which are activated on regular intervals may also extend the effective period for a frightening devices. Devices used to modify behavior in mammals include:

- Electronic guards (siren / strobe-light devices)
- Propane exploders
- Pyrotechnics
- Laser lights
- Human effigies

Wildlife – Exclusion. Physical exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing of culverts, drain pipes, and other water control structures may prevent raccoons and other animals from using these as travel corridors. In those applications, however, consideration must be given for water flow so that the fence does not act to catch and hold water-borne debris. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species which dig, including

coyotes, foxes, skunks, and woodchucks. Areas such as airports, yards or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of mammals into buildings through existing holes or gaps. Electric fences of various constructions have been used effectively to reduce damage to various crops by deer, raccoons, bears and other species (Hygnstrom and Craven 1994, Boggess 1994).

Relocation of damaging mammals to other areas following live capture is generally not effective or cost-effective. Habitats in other areas may already be at carrying capacity, and relocation would most likely result in damage problems at the new location. Relocated animals can have poor survival rates at the new site (Rosatte and MacInnes 1989, Wright 1978, Frampton and Webb 1974) although careful timing of relocation and selection of release site can markedly improve survival rates (Griffith et al. 1989). Relocating animals also runs the risk of spreading parasites and diseases to previously uninfected areas. For example, the spread of raccoon variant of rabies in the eastern U.S. was likely unintentionally accelerated through the translocation of infected raccoons (Krebs et al. 1999). Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions for the relocation of damaging mammals that might be a viable solution, such as when they are considered to have high value such as T&E species. Under the right conditions, relocating wildlife can be a viable and effective wildlife management technique (Craven et al. 1998). Missouri WS would only relocate wildlife at the direction of and only after consulting with the MDC to coordinate capture, transportation, and selection of suitable relocation sites, as well as compliance with all proper guidelines.

Animal Capture Devices:

WS specialists can use a variety of devices to capture mammals. For reasons discussed above under Relocation, captured animals are usually killed via gunshot, cervical dislocation, or chemical euthanasia. However there are occasions where captured animals are relocated, or, in the case of some disease surveillance projects, may be released on site.

Foothold traps are small traps that come in a variety of sizes that allows the traps to be species specific of some degree. These traps are can be set on land or in water. The traps are made of steel with springs to close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws, which hold the animal. Pan tension devices which increase the pressure required to release the trigger on the trap can reduce risks to smaller non-target species.

Cage traps are live-capture traps used to trap a variety of small to medium sized mammals. Cage traps come in a many sizes and are generally made of galvanized wire mesh and are triggered by a treadle in the middle of the cage that closes the door behind the animal being trapped. Cage traps can range from the extremely small, intended for the capture of rodents and other small mammals, to the large corral/panel traps used to live-capture feral hogs.

Sherman box traps are live traps used to capture small mammals such as rodents. These traps are often made of galvanized steel or aluminum and fold up for easy transport. Sherman box traps have a treadle near the back of the trap that triggers the door to close behind the animal being trapped.

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop. When the target species walks into the snare the loop becomes smaller in size, holding the animal as if it were on a leash. In Missouri, when used as a live capture device, snares are equipped with integrated stops that permit snaring, but do not choke the animal. Breakaway

snares are snares designed to break open and release with tension exerted by larger non-target animals such as deer and livestock.

Bow nets are small circular net traps used for small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord.

Hand nets are used to catch small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles

Net guns and cannon nets are devices used to trap mammals. The devices project a net over at target using a specialized gun or other device to carry the net.

NON-LETHAL METHODS: CHEMICAL

Ketamine (Ketamine HCl) is a disassociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allays anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telazol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999). This drug is sold in a powder form and must be reconstituted with sterile water before use. Once mixed with sterile water, the shelf life is four days at room temperature and 14 days if refrigerated.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

LETHAL METHODS: MECHANICAL

Conibear (body gripping) traps are the steel framed traps used to capture and quickly kill mammals. These traps come in a variety of sizes and may be used on land or in the water depending on size and state and local laws. The traps are made of two steel square frames that are hinged on two sides and have one or two springs.

Shooting is highly selective for target species and may involve the use of spotlights and either a handgun, shotgun or rifle. A crossbow or arrow gun may be utilized in special situations where firearms are not practical or allowed. Shooting is an effective method to remove a small number of mammals in damage situations. Removal of specific animals in the problem area can sometimes provide immediate relief. Shooting is sometimes utilized as one of the first lethal damage management options because it offers the potential of resolving a problem more efficiently and selectively than some other methods. Shooting may sometimes be one of the only

damage management options available if other factors preclude setting of damage management equipment. Firearm use may be a public concern because of issues relating to safety and misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment are required to meet criteria contained in the Lautenberg Amendment which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. WS activities where shooting is used include, but are not limited to, the take of deer by the MDC permit Authorization to Destroy Deer in the Control of Wildlife Damage, take of other mammals in damage situations pursuant to MDC permits, and in the airport environment to protect human health and safety.

Sport hunting is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the MDC for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for white-tailed deer, coyotes, and other damage causing mammals.

Snap traps are used to remove small rodents and for population sampling at an airport. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area. These traps pose no imminent danger to pets or the public.

Cervical dislocation is sometimes used to euthanize small rodents which are captured in live traps and when relocation is not a feasible option. The animal is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. When done properly, the AVMA approves this technique as humane method of euthanasia and states that cervical dislocation is a humane technique for euthanasia of small rodents. (AVMA 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished.

Penetrating captive bolt is a method sometimes used to euthanize live-captured deer. It is a hand held device powered by compressed air or gunpowder that discharges a bolt, causing immediate unconsciousness and destruction of brain tissue. Accurate placement of the bolt is essential and animal restraint is required.

LETHAL METHODS: CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) administered by the EPA and the Missouri Department of Agriculture (MDA) or by the Food and Drug Administration. WS personnel that use restricted-use chemical methods are certified as public operators by the MDA and are required to adhere to all certification requirements set forth in FIFRA and Missouri pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

Sodium pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Zinc phosphide, is a metallic pesticide used on grain, fruit, sunflower seed, meat, or vegetable baits to reduce damage by mice, voles, ground squirrels, Norway rats, and woodchucks. Zinc phosphide is toxic to most forms of life. It has a strong, pungent, garlic-like odor that actually is attractive to rodents such as rats, but may be unattractive to some other animals. Zinc phosphide comes in prepared baits on wheat and oats, or it can be prepared on apples, carrots, or other baits

attractive to the target animal. Prebaiting with the same bait carrier is used prior to bait application to make the treatment more effective. When zinc phosphide comes into contact with dilute acids in the stomach, phosphine gas is released and causes death. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication occurs with severe damage to the liver. Animals that are alive after 3 days almost always completely recover.

Once in the soil, zinc phosphide rapidly creates phosphine when it comes into contact with soil moisture, which is either released into the atmosphere or converted into phosphates and zinc complexes. Translocation of phosphine has been demonstrated, but it is rapidly converted to harmless phosphates. Use of zinc phosphide on various types of fruit, vegetable, or cereal baits has proven to be effective at suppressing local populations of target animals. Specific bait applications are designed to minimize non-target hazards.

Zinc phosphide is 2 to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Brock 1965, Evans et al. 1970, Schitoskey 1975, Bell and Dimmick 1975, Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Matscke et al. 1983, Marsh 1987, Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) most rodents die in their burrows and are unavailable to raptors and scavengers (Knowles 1986), and 4) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Tkadlec and Rychnovsky 1990, Johnson and Fagerstone 1994). Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents (USDA 1997 Revised).

Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. They determined that no differences were observed between pretreatment and post-treatment populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, but the effect was not statistically significant because deer mouse densities are highly variable and the reduction was short-lived (Deisch et al. 1990). Matschke and Andrews (unpubl.) reported no mortality or signs of poisoning or emesis in ferrets after 3 days of feeding on zinc phosphide killed prairie dogs, prompting the investigators to conclude that the risk of ferret secondary poisoning from zinc phosphide was low.

Ramey et al. (2000) reported that 5 weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but

observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (i.e., bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982) and Matschke et al. (1983).

Deisch et al.(1989) studied the effect that zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, but spider mites, crickets, wolf spiders, ground beetles, darkling beetles, and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989).

Strychnine is a white, bitter-tasting pesticide that is highly toxic to most species of mammals and birds, with the exception of gallinaceous birds. It is available for below-ground use only to reduce gopher (*Thomomys spp.* and *Geomys spp.*) damage. Above-ground uses of strychnine were canceled in 1988 because of the high potential for non-target take. Four formulations are currently available for use in the United States; two are restricted-use and two are general use. Strychnine is available on milo and oats for use with mechanical burrow builders or hand placement. Burrow builders create underground burrows and drop baits in them. Gophers intersect these burrows, consume the baits, and die underground. Baits can also be placed in active burrow systems by hand. Gophers that consume these baits mostly die underground (Nolte and Wagner 2001). Non-target species that use gopher burrow systems such as field mice (i.e., *Peromyscus spp, Zapus spp., Reithrodontomys spp., Ochrotomys spp., Microtus spp.*), chipmunks (*Tamias spp.*), and jackrabbits (*Lepus* spp.) are a primary non-target hazards. Strychnine kills animals relatively quickly and unassimilated baits can be found in the gut contents. Some primary non-targets, and few gophers may potentially die above ground and pose a potential risk of secondary hazards to scavengers; this hazard has been shown to be quite low. Since strychnine poses at least the potential of secondary poisoning, it is conceivable that a smaller predatory or scavenger species (primarily those which can enter burrows) could be affected by consuming targeted gophers. Strychnine is used mostly to protect alfalfa in the United States, but has been used to protect other agricultural resources and forests. WS rarely uses strychnine operationally.

Gas cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow, the resultant carbon monoxide and other gases cause asphyxiation. The risks assessment for the use of gas cartridges for rodent management in (USDA 1997 Revised) state that the only risks to non-target species are risks to rodents and other species found in burrows with the target species. WS will not use gas cartridges in areas where State or Federally listed species may be in burrows with the target animals.

Anticoagulant rodenticides come in a variety of formulations and many are available as rodenticides from commercial vendors. WS would only use anticoagulant rodenticides in areas near homes, buildings and other structures which should reduce exposure to non-target species. Anticoagulants come in single dose and multiple dose formulations. The active ingredients in anticoagulants used by WS include bromadiolone, brodifacoum, chloraphacinone, difethialone, and diphacinone. These baits, following single or multiple feedings (depending upon type), reduce the clotting ability of blood and damage capillaries. Over time, the rate of blood clotting slowly decreases and blood loss from the damaged capillaries leads to death. Primary hazards must be guarded against by placing baits in containers or other inaccessible areas to pets, children, livestock, and non-target species because anticoagulants are toxic to other species, especially mammals, at low concentrations. Non-target hazards are mitigated through bait formulation and design and placement of bait boxes. For example, use of block formulations of bait prevents bait

from being shaken or spilled out of bait boxes. Tamper resistant bait stations and design of the size of the entry hole also reduces risk to nontarget species. Anticoagulants, especially brodifacoum, difethialone, and bromadiolone also have a high potential for secondary poisoning. However, these risks are somewhat mitigated by the fact that predator scavengers would usually need exposure to multiple carcasses over a period of days in order to experience toxic effects. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions.

EVALUATION OF IMPACTS

WS would not be conducting any habitat management activities, although we recommend habitat management as a damage management strategy. In these instances, WS will remind landowners/managers of the potential for impacting State and Federally listed species and advise that the property owner/manager consult with the USFWS and/or MDC prior to initiating any habitat management activities. However, as discussed below, some WS activities may have beneficial impacts on habitat used by some species. Federally listed species would only be adversely impacted by the proposed action if they are accidentally caught in capture devices or consume rodenticides intended for another species.

MAMMALS

Gray Bat *(Myotis grisescens)*
Indiana Bat *(Myotis sodalis)*
Ozark big-eared bat *(Plecotus townsendii ingens)*

Most of Missouri WS' involvement in bat damage management is limited to providing technical assistance. Technical assistance provided by WS is similar to that in (Pierce and Clawson 2006). Technical advice includes recommendations to avoid using exclusion devices until young can leave the site to avoid orphaning/killing young bats. Where applicable, WS will make the property owner/manager aware of the possibility that there may be a State and/or Federally listed bat at the site and will provide the property manager with information on how to contact the State and USFWS regarding listed bats.

Occasionally (once or twice a year), WS receives a requested to assist with a threat to human heath and safety related to bats (e.g., a bat has bitten or scratched some one and WS is requested to capture the bat so it can be tested for rabies, or a request to remove a bat from a public building). Over the period of 2003-2005 WS captured and released 2 bats and hazed a third from a site where it was causing concerns. The areas where WS provides this type of assistance are generally not the type of habitat used by the State-listed bats in Missouri. WS personnel who respond to requests for assistance with bats will be trained in the identification of State-listed bats in Missouri. In the event that the problem appears to be related to a State/Federally-listed bat, WS will contact the MDC and/or the USFWS Missouri Field Office as appropriate. Given the extremely low likelihood that a State-listed bat will be at the sites where WS provides assistance and the low frequency of WS' direct assistance with bat management and that WS' actions rarely result in the death of the bat, the proposed action may affect but is unlikely to adversely affect the gray bat, Indiana bat or Ozark big-eared bat.

Black-tailed jackrabbit (*Lepus californicus*): Risks to black-tailed jackrabbits from the proposed action include unintentional death of animals captured in snares or traps intended for other species, and the potential for black-tailed jackrabbits to consume rodenticide bait. Risks from both these factors appear to be minimal. The EA provides data on WS target and non-target species take for the state of MO for the period of 2003-2005 (Tables 4-1 and 4-3). No jackrabbits were captured by Missouri WS during this interval and WS was able to release all non-target animals.

The only rodenticide likely to pose any risks to black-tailed jackrabbits is zinc phosphide. Strychnine bait would be placed underground in burrow systems of rodents smaller than black-tailed jackrabbits (e.g., pocket gophers) and would likely be difficult for jackrabbits to access. Anticoagulant baits used in areas

where jackrabbits might occur would only be used in bait stations which would prevent access by jackrabbits. Opportunities for black-tailed jackrabbits to encounter sites where WS uses zinc phosphide baits are likely to be very limited. WS' primary use of zinc phosphide would be at airports where the presence of all wildlife is actively discouraged. Additionally, because of the wildlife surveys required for Airport Wildlife Hazard Management Plans, WS would be aware of the presence of jackrabbits at the site and can adjust management decisions accordingly. WS' off-airport use of zinc phosphide is likely to be infrequent and restricted to a limited number of small sites in the state. Based on this analysis WS concludes that the proposed action will not adversely impact black-tailed jackrabbit populations in the state.

Spotted skunk (*Spilogale putorius*): Risks to spotted skunks from the proposed action include unintentional death of animals captured in snares or traps intended for other species, and the potential for spotted skunks to consume rodenticide bait. Risks from both these factors appear to be minimal. The EA provides data on WS non-target species take for the state of MO for the period of 2003-2005 (Table 4-3). WS was able to release all non-target species. Nationwide for the entire WS program, non-target take of spotted skunks over the period of 2002-2004[4] ranged from 5-16 spotted skunks per year. All but one of these animals were taken in the State of Washington where WS was conducting an atypical program using leg-hold traps to capture mountain beaver (*Aplodontia rufa*).

The only rodenticide likely to pose any risks to spotted skunks is zinc phosphide. Strychnine bait would be placed underground in burrow systems of rodent smaller than spotted skunks and would likely be difficult for spotted skunks to access. Anticoagulant baits would only be used in bait stations which would preclude access by spotted skunks. Opportunities for spotted skunks to encounter sites where WS uses zinc phosphide baits are likely to be very limited. WS primary use of zinc phosphide would be at airports where the presence of all wildlife is actively discouraged. WS off-airport use of zinc phosphide is likely to be infrequent and restricted to a limited number of small sites in the state. No spotted skunks were harassed or taken intentionally or unintentionally by MO during the period of 2003-2005. Secondary hazards to skunks from scavenging on carcasses of rodents killed with zinc phosphide are likely very low because zinc phosphide breaks down rapidly in the digestive tract of target animals, the emetic properties of zinc phosphide, the tendency for nontarget animals to die in their burrows, and the tendency for most mammalian predators and scavengers to avoid consuming the viscera which might contain undigested bait (see above description of zinc phosphide). Based on this analysis WS concludes that the proposed action will not adversely impact spotted skunk populations in the state.

BIRDS

Swainson's warbler (*Limnothlypis swainsonii*): Swainson's warblers inhabit and breeding in stands of giant cane (*Arundinaria gigantea*) within extensively forested landscapes along stream and river flood plains with high canopy cover and dense vegetation. In Missouri, Swainson's warblers may be found in the southeastern part of the state and along the southern border. Swainson's warblers prey on insects found in among leaf litter. Projects to reduce feral swine damage to native habitats may be beneficial to this species. None of the other mammal damage management methods that would be used by WS under this EA would impact this species. Therefore, the proposed action would have no effect or a beneficial effect on Swainson's warblers.

Interior Least Terns (*Sterna antillarum athalassos*) and King Rails (*Rallus elegans*): Least terns use barren to sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines. King rails prefer wetlands with abundant grasses, sedges, rushes and cattails. Neither species would be attracted to the foods used by WS to deliver pesticides. The only MDM likely to be conducted at sites used by terns or rails are projects intended to reduce predation on nesting adult terns, their eggs and/or young (terns and rails) and projects intended to reduce feral swine damage to wetlands (primarily rail habitat). These projects would be beneficial to the species. WS will consult with the MDC and USFWS as appropriate prior to initiating any project for the protection of these species from predation. Therefore, the proposed action will have no effect on or a beneficial effect on least terns or king rails.

[4] National data for 2005 is not available due to difficulties with the WS data management system.

Snowy Egrets (*Egretta thula*) and American Bitterns *(Botaurus lentiginosus*): Snowy egrets inhabit wetlands and shores of lakes, ponds and small rivers. In Missouri they use marshes and lowland forests in the Southeastern corner of the state along the Mississippi river. Snowy egrets nest in colonies in trees or low-growing marsh plants. American bitterns are secretive birds found in wetlands in most parts of North America. In Missouri, American bitterns nest in permanent wetlands with tall emergent vegetation. They prey on a variety of foods including small rodents. However, as discussed above, because of the nature of the products and method of WS application, risks to predatory birds from the rodenticides that could be used by WS are low. Additionally, WS use of rodenticides will be confined to airports, croplands, orchards, and areas in and around buildings. These types of areas are not used by these species. Therefore, the proposed action would have no effect on or a beneficial effect on snowy egrets and American bitterns

Bachman's Sparrow (*Aimophila aestivalis*) and Greater Prairie Chicken (*Tympanuchus cupido*): Bachman's sparrows typically nest and forage in glades, open pinewoods and overgrown grassy fields with scattered shrubs and trees. Greater prairie chickens historically occupied grasslands bordered by oak woodlands, savannahs and wetlands. Because of current limitations on preferred habitat, prairie chickens also inhabit cropland and nearby prairies, primarily in the Osage Plains. Both species eat seeds and grains and could, theoretically, be exposed to rodenticides on grain baits. However, risks of this type of exposure are negligible. The only two toxicants formulated on grain baits that are proposed for use by WS are strychnine and zinc phosphide. Strychnine grain baits are only used in underground applications and WS employees comply with label directions for clean up and disposal of any above-ground spilled grain. Therefore the use of strychnine baits should pose no risk to these species. The discussion above indicates that risks to nontarget birds from zinc phosphide baits are likely to be very low, in part because: 1) birds are less likely to accept grains discolored by zinc phosphide, 2) Birds appear particularly susceptible to the emetic effects of zinc phosphide 3) birds have a negative sensory response to zinc phosphide. See also discussion of zinc phosphide above. WS primary use of zinc phosphide would be at airports where the presence of all wildlife is actively discouraged. WS off-airport use of zinc phosphide is likely to be infrequent and restricted to a limited number of small sites in the state. All wildlife use of these sites is actively discouraged and risks of any nontarget birds accessing bait are extremely low. Based on the above analysis, we conclude that the proposed action may affect but is unlikely to adversely affect Bachman's sparrows or greater prairie chickens.

Northern harrier (*Circus cyaneus*), Peregrine falcon (*Falco peregrinus*), Barn owl (*Tyto alba*): All three of these avian predators eat rodents and have the potential to catch rodents that have eaten rodenticides. Northern harriers may also consume carcasses of rodents that have been killed by rodenticides. However based on the discussions for particular products presented above and material and protective measures presented below, we conclude that these risks are very low and unlikely adversely affect populations of these species.

Risks of secondary poisoning associated with the use of zinc phosphide are low, primarily because zinc phosphide breaks down quickly in the digestive tract of affected animals so predators and scavengers are generally not exposed to the compound. Knowles (1986) reported that most rodents die in their burrows and are unavailable to raptors and scavengers. WS complies with label requirements for the collection and disposal of carcasses from animals found in areas where rodenticides are used. Bird species which have been fed zinc phosphide-poisoned prey during lab studies and were apparently unaffected included black-vultures, bald eagles, golden eagles, and great horned owls (Doty 1945 in Hood 1972, Evans et al. 1970 in Hood 1972, Bell and Denmininck 1975, Schitoskey 1975, Hill and Carpenter 1981). Secondary hazards in these studies were also generally reduced because animals regurgitate poisoned prey or may reject poisoned prey when other prey is available. In field studies, predatory birds and mammals were observed foraging on poisoned prey, with no apparent secondary effects. These species included American crows, common ravens, turkey vultures, and black-billed magpies feeding on poisoned jackrabbits (Griffith 1972 cited in Johnson 1991 a, b), barn owls and the endangered Hawaiian hawk feeding on poisoned rats (Pank et al. 1975).

The presence of strychnine in the gastro-intestinal tracts of poisoned animals has been shown to produce secondary toxicity to predators and scavengers (USEPA 1980). Secondary poisoning is more likely for

carrion-eating mammals than for raptors, which generally eviscerate prey and remove the poisoned gastro-intestinal tract prior to ingestion (USEPA 1980). Risk analysis in the WS Programmatic EIS (USDA 1997 Revised) indicates that there are potential risks from chronic exposure for the American kestrel and other raptors from consuming animals surfacing from their burrows. However, studies indicate almost all target animals are likely to die in their burrows and risks may actually be lower than analyzed in the programmatic EIS (Knowles 1986, Nolte and Wagner 2001). Some non-target rodent carcasses may be found above-ground, but WS complies with label requirements for carcass retrieval and disposal to minimize these risks. In a 1992 USFWS biological opinion on the potential impacts of the WS program on the peregrine falcon (including the use of zinc phosphide, above and below-ground use of strychnine bait and anticoagulant rodenticides, only the above-ground use of strychnine was identified as posing a potential risk to peregrine falcons and the USFWS determined that, "the use of strychnine in the ADC program will not jeopardize the continued existence of the peregrine falcon..." (USDA 1997 Revised).

Based on the above analysis, we conclude that the proposed action will not adversely affect state populations of barn owls, Northern harriers or peregrine falcons.

Bald Eagle (*Haliaeetus leucocephalus*). Risks associated with all of these methods were analyzed in the 1992 Biological Opinion from the USFWS on the National WS program (USDA 1997 Revised). Findings from the national consultation are still applicable to the proposed mammal damage management program in Missouri.
The USFWS concluded that the above ground use of strychnine and foot-hold traps were the only methods likely to pose a risk to bald eagles, below ground use of strychnine was not identified as a risk to eagles. Above ground use of strychnine bait is no longer permitted by the US EPA. Risks to eagles from the use of foothold traps are minimal because WS uses pan-tension devices to prevent smaller non-target species from triggering the device and because of the provision, discussed below, requiring that foot-hold traps be placed a minimum of 30 feet from above-ground bait (meat) sets. We have copied the relevant Reasonable and Prudent measures and Terms and Conditions for the protection of eagles from the 1992 biological opinion below for your reference.

The USFWS 1992 biological opinion provides for incidental take of eagles and lists the following reasonable and prudent measure relevant to the WS predation management program in Missouri

2) When bald eagles are in the immediate vicinity of a proposed control program, ADC [WS] personnel must conduct daily checks for carcasses or trapped individuals. Carcasses of target animals taken with any chemical that may pose a secondary poisoning hazard must be immediately removed and disposed of in a manner that prevents scavenging by any nontarget species.

The 1992 Biological Opinion also established the following terms and conditions.

4) WS personnel shall contact either the local state fish and game agency or the appropriate regional or field office of the Service to determine nest and roost locations.
5) The appropriate USFWS office shall be notified within 5 days of the finding of any dead or injured bald eagle. Cause of death, injury or illness, if known, should be provided to those offices.
6) Foothold traps shall be places a minimum of 30 feet from above-ground bait (meat) sets.

A new national consultation for the WS program is in progress. Once completed, WS will adhere to provisions for the protection of federally listed species provided in that consultation.

FISH, MOLLUSKS, INSECTS, SNAILS, REPTILES and AMPHIBIANS

Lake sturgeon (*Acipenser fulvescens*)
Ozark cavefish (*Amblyopsis rosae*)
Crystal darter (*Crystallaria asperella*)
Swamp darter (*Etheostoma fusiforme*)

Harlequin darter (*Etheostoma histrio*)
Niangua darter (*Etheostoma nianguae*)
Goldstripe darter (*Etheostoma parvipinne*)
Redfin darter (*Etheostoma whipplei*)
Spring cavefish (*Forbesichthys agassizi*)
Cypress minnow (*Hybognathus hayi*)
Taillight shiner (*Notropis maculates*)
Sabine shiner (*Notripis sabinae*)
Topeka shiner (*Notropis Topeka*)
Mountain madtom (*Noturus eleutherus*)
Neosho madtom (*Noturus placidus*)
Longnose darter (*Percina nasuta*)
Flathead chub (*Platygobio gracilis*)
Pallid sturgeon (*Scaphirhynchus albus*)
Central mudminnow (*Umbra limi*)
Tumbling creek cavesnail (*Antrobia culveri*)
Elephantear (*Elliptio crassidens*)
Curtis' pearlymussel (*Epioblasma flornetina curtisi*)
Snuffbox (*Epioblasma triquetra*)
Ebonyshell (*Fusconaia ebena*)
Pink mucket pearlymussel *(Lampsilis rafinesqueana)*
Higgins eye pearlymussel (*Lampsilis Higgins)*
Scaleshell *(Leptodea leptodon))*
Sheepnose mussel (*Plethobasus cyphyus)* .....
Fat pocketbook (*Potamilus capax*)
Winged mapleleaf (*Quadrula fragosa*
American burying beetle (*Nicrophorus americanus*)
Hines Emerald Dragonfly (*Somatochlora hineana*)
Western chicken turtle (*Deirochelys reticularia miaria*)
Western fox snake (*Elaphe vulpine vulpine*)
Blanding's turtle (*Emydoidea blandingii*)
Yellow mud turtle (*Kinosternon f. flavescens*)
Illinois mud turtle (*Kinosternon f. spooneri*)
Mississippi green watersnake (*Nerodia cyclopion*)
Eastern massasauga (*Sistrurus catenatus*)
Eastern hellbender (*Cryptobranchus a. alleganiensis*)
Ozark hellbender (*Cryptobranchus alleganiensis*)

In general, the activities proposed in this EA will have no effect on these species. However, it is possible that damage to riparian areas and other habitats by feral swine may cause adverse impacts on State-listed species. In these instances, WS removal of feral swine would be beneficial to State-listed species. Feral swine populations in 3 counties in Missouri utilize riparian areas causing severe damage and sometimes loss to vegetation and stream bank stabilization by their rooting and wallowing. The State-listed endangered Hine's emerald dragonfly's is also directly affected by feral swine. Just recently discovered in Missouri, the dragonfly has an unknown status in the state and is found in Reynolds County located in the Missouri Ozark fen complex. Feral swine utilize these fens to wallow in, frequently causing significant damage. The Hine's emerald dragonfly deposits its eggs in slow moving streams also utilized by feral swine. The Federal and State endangered tumbling creek cavesnail's only known population in the world is in Taney County where rooting and wallowing by feral swine in the recharge area of Tumbling creek cave has resulted in increased erosion and increased populations of invasive plant species. The loss of vegetation in these riparian areas leads to increased siltation and chemical runoff which negatively affects all Karst species including the Federal and State threatened Ozark Cavefish. For these reasons, the proposed action may affect but are unlikely to adversely affect State-listed fish, mollusks, insects, snails, reptiles and amphibians in Missouri.

VASCULAR PLANTS

Mead's milkweed (*Asclepias meadii*)
Decurrent false aster (*Boltonia decurrens*)
Geocarpon (*Geocarpon minimum*)
Virginia sneezeweed (*Helenium virginicum*)
Small whorled pagonia (*Isotria medeoloides*)
Missouri bladder-pod (*Lesquerella filiformis*)
Pondberry (*Lindera melissifolia*)
Eastern priarie fringed orchid (*Platanthera leucophaea*)
Western prairie fringed orchid *(Platanthera praeclara)*
Running buffalo clover (*Trifolium stoloniferum*)

In general, WS' MDM activities will have no impact on State-listed plants. However, in some situations, feral swine may damage habitat needed for listed plants. For example, feral swine have damaged the federally threatened and State endangered Mead's milkweed by rooting up the plant during feeding. The plant's igneous glade habitat found in the Missouri Ozarks has also been damaged by feral swine rooting activity. WS' removal of feral swine may have beneficial impacts on species adversely impacted by feral swine. Therefore, the proposed action may affect but is unlikely to adversely affect State-listed plants.

Based on the above analysis, we conclude that the proposed action will not adversely impact populations of any State-listed endangered species and request your opinion on this determination. Thank you for your assistance with this consultation. If you need any additional information or if there is anything I may do to be of assistance please feel free to contact me.

Sincerely,

Robert C. Alexander
Wildlife Specialist

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